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[OFFICIAL NOTICE.]

OFFICE OF SECRETARY WESTERN GAS ENGINEERS AND SUPERINTENDENTS' ASSOCIATION,
LOUISIANA, MO., March 25, 1879.

The Annual Meeting of the above Association will be held at the Tremont House, in Chicago, on Wednesday, May 14th, 1879, at 10 o'clock, A. M.

LEE A. HALL, Secretary.

[OFFICIAL NOTICE.]

OFFICE AMERICAN GAS-LIGHT ASSOCIATION,
117 BROADWAY, N. Y. CITY.

To the Members of the Association:

The time for sounding the note of preparation for the next meeting of the Association, to be held in the city of Philadelphia, on the 15th, 16th and 17th of October next, has arrived. Many members deeply interested in the success of the Association, and in the promotion of the objects for which it was formed, have expressed an earnest wish that this meeting may be made the best and most profitable to the members of the Association, as well as to the gas fraternity of the world, of any meeting yet held.

Vigorous efforts will be made to have a sufficient number of papers prepared and read, from different members, on topics of a practical interest to gas manufacturers. A list of topics, upon which papers will be solicited, will appear in the next issue of the JOURNAL.

Another important matter in connection with the meeting, and as a part of it, has been suggested, which meets the hearty approval of all members conferred with on the subject.

It is proposed to have an exhibition of the machinery, tools, and implements used in the manufacture, purification, measurement, and consumption of gas—the retort to the burner, and all between—including the different varieties of gas heating and cooking stoves, and gas engines—the heating and cooking stoves to be in practical use, and the gas engines running. The extension of the use of gas for other purposes than light being a prominent feature in the exhibition.

It is hoped that each member will, for himself, resolve that the coming meeting shall be an honor to himself and to the Asssociation.

CHARLES NETTLETON, *Secretary.*

STREET LIGHTING.

We surrender considerable of our space to-day to a portion of the report of the Commissioner of Public Works in this city, and to the report of the Bureau of Lamps and Gas, which contains statistical information of value as a matter of reference. The arguments in favor of larger burners, and longer hours of burning, are unanswerable so far as what *ought* to be done is considered.

Since the publication of the report we have received some information, with reference to street lighting in London by the ordinary system, which is of interest in this connection.

The hours for lighting are from sunset to sunrise, nominally, 4,300 hours per annum; about one hundred hours less than this amount is the actual time, and the burners consume 5 feet per hour. The lamps average about fifty yards apart, but the distance is by no means uniform. The parishes or local authorities pay the same price for gas as is charged to private consumers. If the price of gas was 3s. 4d. per thousand, the cost would be as follows, for each lamp per annum:

4200 hours, at 5 ft. per hour, consumes 21,000 cu. ft. of gas per annum—

	£.	s.	d.
21,000 cubic feet at 3s. 4d. per M.	3	10	0
Lighting, repairs, etc.		15	0
Cost per lamp per annum	£4	5	0

or about $21.25 in currency.

The public authorities provide the lamp posts, but the gas companies keep them in order, at the charge of 15s., or $3.75 per lamp per year.

It is to be regretted that, in some communities, it is deemed an economy to reduce the size of burners in street lamps. This is a fatal error, if the object is to have a respectable light. The amount of light obtained increases so much more rapidly than the amount of gas burned, that it seems strange that any one should hesitate for a moment about the proper way to use gas. The only way that gas should be burned is to use the larger burners, being sure to get as good a combustion as possible, and then, if the money will not hold out, reduce the number of lamps. Money properly spent in street lighting is the best investment a city can make. It reduces the expenses for watchmen, police courts and jails.

The Edison Electric Light.

Mr. Editor :—I have the pleasure of translating for you the most interesting portions of the recently published (April, 1879) opinion of M. Hippolyte Fontaine, without question the highest authority upon the theory and practice of the various methods of illuminating by means of electricity, in reference to the novelty and practicability of Mr. Edison's most recent inventions. M. Fontaine has evidently had every opportunity of seeing Mr. Edison's French patents, including the text and the drawings of his lamps and dynamo-electric machines.

Yours with respect, V.

Newark, April 25, 1879.

P. S. I have just seen the New York *Herald* of April 25, containing the description of Mr. Edison's lamps. It is these lamps and this system of lighting that M. Fontain considers practically worthless.

"THE EDISON PROCESS."

"We have at last been able to look into the French patent of Mr. Edison, and, far from retracting the impression produced by reading the *Scientific American*, we are more than ever convinced that the system of electric lighting of the savant of Menlo Park is far below his reputation, and that nothing, absolutely nothing, in the new patent, should have stirred up the panic which has taken place among gas shareholders in Europe and America. It is truly a great and regrettable mystery.

"Let us say that, from a theoretical standpoint, the apparatus devised by Mr. Edison is far from being absurd. The patent contains ingenious details, and certain arrangements that are original enough; but, from a a practical stand point, the only point that can interest the holder of gas stock, everything is inferior, childish, or not to be realized. We would not even have spoken of this patent, if the claimant had not had the extraordinary merit to invent the phonograph. It is necessary, above all, to combat the errors of great inventors, because they are the most dangerous. The patent of Mr. Edison contains nearly fifty descriptions; we will only publish those that contain the germs of the invention, and will pass by the numerous variations which do not present any real interest.

"As in every complete system of electric lighting, so this contains a generator of electricity and a regulator lamp.

After describing the generator, and the principle upon which Mr. Edison intends to construct it, M. Fontaine sums up, saying :

"Consequently, it is not necessary to experiment with a machine constructed upon the preceding principle, to be able to affirm that it will give results far inferior to those now in use. Mr. Edison puts forth the singular pretension of creating a good machine in associating two principles which are defective, as is known by all the world. It is a capital error, and one which would never have originated in the brain of a practical man."

M. Fontaine then goes on giving a description of Mr. Edison's lamp, and criticises the same. He concludes as follows :

"Decidedly, the holders of gas shares may sleep quietly. The invention that will destroy the value of their property has not yet been conceived."

March Review, from "Stowell's Petroleum Reporter."

The result of the operations in the producing regions of Pennsylvania the past month, as shown in our tables, is certainly surprising to use a very mild expression. They reveal a state of affairs that have never before existed in the oil regions, and we think gives very little hope for the immediate future.

By inspecting our tables the following facts will appear :

1st. That there were more wells drilling at the close of the month than in any corresponding month since 1870.

2nd. More wells were completed during the month than in any month since November, 1878.

3rd. The daily average production of the new wells was larger than in any previous month of which we have a record.

4th. The number of rigs erected and being erected at the close of the month exceeds that of any previous month.

5th. The amount of crude produced in the month was larger than in any previous month since the commencement of the business.

6th. The amount of stock in the producing region exceeds the amount ever before held.

7th. The shipments out of the region was larger than in any corresponding month in the past.

8th. The price of crude at the wells ruled lower than in any corresponding month since 1862. With these facts, plainly in view, the developments apparently are to be pushed with vigor through the coming summer months in the Bradford district.

Department of Public Works.

EXTRACTS FROM REPORT FOR THE QUARTER ENDING DECEMBER 31, 1878.

DEPARTMENT OF PUBLIC WORKS,
COMMISSIONER'S OFFICE, ROOM NO. 19, CITY HALL,
NEW YORK, February 25, 1879.

Hon. EDWARD COOPER, *Mayor of the City of New York* :

SIR—In accordance with Section 27 of the Charter, I have the honor to submit herewith a report of the transactions of this Department for quarter ending December 31, 1878 :

EXPENDITURES.

On account of appropriations raised by taxation	$440,725 65
On account of assessment fund for street improvement	207,956 30
On account of funded debt, for improvement and extension of water supply	222,330 52
Total	$871,012 47

Expenditures for the Corresponding Quarter in 1874, 1875, 1876, *and* 1877.

Fourth quarter, 1874	$2,031,695 26
" 1875	1,651,926 28
" 1876	997,663 37
" 1877	902,005 90

BUREAU OF CHIEF ENGINEER OF THE CROTON AQUEDUCT.

In October last the construction of the Storage Reservoir on the middle branch of the Croton river was finally completed, and the work accepted.

From October 1 to December 10 the water in the reservoir rose 19 feet 4¼ inches. The dam and appurtenances have stood this severe test, and in good order. The entire cost to date, including land, damages, labor and materials, engineering and supervision, and legal expenses, is $656,063.89.

The sudden rise of water following the severe storms of December 9th and 10th caused some damage at the outlet of Lake Gleneida, which has been repaired. It has also developed the necessity of making some alterations at the overfall of the Boyd's Corners Reservoir, to prevent injury from heavy freshets.

At the request of the commissioners of appraisal in the matter of water rights and damages, Lakes Mahopac and Kirk were drawn to the proposed low-water mark, to enable them to view the lakes in that state, and arrive at a just estimate of the awards to be made.

The rainfall at Boyd's Corners during the quarter was 16 88-100 inches.

Excepting six days in October, the natural flow of the Croton river was sufficient to fill the aqueduct.

The Croton Aqueduct has been subjected to severe tests by the heavy storms which occurred during the quarter, and rendered necessary an extra amount for repairs to ditches, drains, culverts, fences, and roads.

By the construction of a new roadway over the embankment on the third division, access is given to the keeper's house and storage buildings, and the expense of keeping in order a private roadway, heretofore used, is abolished.

The Department had no means to prosecute the necessary work of strengthening the aqueduct in accordance with the plans heretofore adopted and pursued.

In extending and improving the water supply 32,855 lineal feet of water pipe were laid and 260 fire-hydrants set during the quarter.

Since the 24th of December, when extreme cold weather set in, the excess of consumption of water over the quantity delivered by the aqueduct has averaged six to eight million gallons per day, causing a steady decrease in the reservoirs and in the pressure.

The amount collected for water supplied to shipping and for building purposes during the quarter is $25,874.16.

The inspectors of the Department visited 16,341 buildings, and detected 3,723 leaks in fixtures, and 373 cases of willful waste through neglect to keep faucets closed.

BUREAU OF LAMPS AND GAS.

The total number of public lamps in use in the city was increased during the quarter from 21,453 to 21,539.

Seventy-two new lamps were erected, 53 old lamps relighted, and 39 lamps discontinued.

The photometrical tests of the quality of the gas furnished by the gas companies (excepting the Municipal Gas Light Co., whose mains are not yet connected with the photometrical rooms) show that the standard required by the contracts with the city is maintained.

Further information on the subject of lighting the city will be found in

the review of the transactions of the Department for the year 1878, included in this report.

THE WATER SUPPLY.

During the past year the rainfall was so abundant in the Croton Valley, and so well distributed throughout the year, that no difficulty was experienced in getting sufficient water to keep the aqueduct filled to its utmost capacity, and for short periods only in July, August, and October was it necessary to draw upon the stored water, when 724,700,000 gallons were drawn from the reservoir at Boyd's Corners, and 526,300,000 from Lake Mahopac.

The New Storage Reservoir on the middle branch of the Croton river, completed in October last, was commenced in 1874. Its area is 430 acres; greatest depth, 62 feet; and capacity, four thousand million gallons. The dam is 515 feet long, 94 feet high from bottom of foundation to top, 660 feet wide at the bottom, and 50 feet on top. The whole work includes 377,269 cubic yards of earth and rip-rap embankment; 54,318 cubic yards of rock excavation; 62,463 cubic yards of earth excavation; 17,393 cubic yards of rubble masonry; 62,980 lineal feet of fence walls; 98,167 square feet of timber; 36,472 pounds of iron work, and many other minor items. The cost, including land, construction, superintendence, legal expenses, damages, etc., is $656,063.89, with one claim for damages—that of the Tilly Foster Iron Mine—yet under adjudication by legal process.

With this new reservoir, the one at Boyd's Corners, and the natural lakes, our storage capacity in the Croton Valley is 9,500,000,000 gallons, sufficient to insure a full supply at all times for the present aqueduct.

As already stated in previous reports, the unusual strain to which the Aqueduct has for some time been subjected, in order to convey the increased volume of water required for daily consumption, rendered it necessary to strengthen the masonry of the Aqueduct and protection walls and embankments where the structure is built upon stone walls laid dry across intersecting ravines. These walls have settled in several places, causing cracks and leaks in the Aqueduct The only available means to pay for this additional work was in the usual annual appropriation for maintenance of the Aqueduct, and the progress made in it is therefore necessarily slow. The general plan of improvement consists in raising and strengthening the spandrills, increasing the thickness of the arch by an additional course of brick masonry, raising the protection and retaining walls, and placing additional earth on the side embankments, taken from the covering over the arch. In pursuance of this plan, the following quantities of work were done last year:

2,151 lineal feet of roof arch built.
5,098 cubic yards of earth taken from the top and placed on the sides.
812 cubic yards protection walls built.
600 cubic yards stone quarried.

Since the fall of 1876, when this work was commenced, 3,090 lineal feet of the Aqueduct has thus been improved, and many cracks and leaks stopped.

There are still about 19,000 lineal feet requiring strengthening, 9,000 feet of which are in such condition as to need immediate attention. For three years past, in presenting my estimates for the maintenance of the Aqueduct to the Board of Estimate and Apportionment, I asked for a moderate increase beyond the usual appropriation, in order that more rapid progress might be made in the absolutely necessary repairs of the only artery by which the city receives its water supply, and both in writing and orally I earnestly urged the allowance. But I regret to say that for 1877 and 1878, when I asked for $25,000 and $15,000 respectively over the appropriation for 1876, no allowance was made; and for 1879 the Board allowed only $5,000 of the $15,000 asked.

By transfers of $3,000 in 1877, and $12,000 in 1878, from available balances of other appropriations of this Department, the deficiency was in part supplied, but such transfers are too uncertain to be relied upon. Every available dollar of the sum appropriated will be devoted during the coming season to these extraordinary repairs, and perhaps no breach may occur; but the matter is too serious to allow the consideration of a few thousand dollars to stand in the way of such repairs as shall insure the safety of this structure. The responsibility of this department is very serious in maintaining the water supply, and it seems to me that the moderate and reasonable sums deemed necessary by the Engineers should be granted.

I may be compelled to ask additional means from some other fund or appropriation.

DISTRIBUTION OF WATER.

There has been no interruption in the high service supply which is pumped from the aqueduct at High Bridge into the reservoir and tank at the top of the tower by steam engines in constant operation, but in consequence of the extension of the service beyond its intended limits, and of the increased consumption, the pressure is not so great as the comfort and convenience of the people demand.

In December last the Common Council finally adopted, and the Mayor approved, the necessary resolution to enable the Department to build the additional high service works contemplated by an act of the Legislature of 1878, chapter 386, and long ago recommended by me. The works will be located on the ground lately occupied by the Masonry Aqueduct, between Ninety-seventh and Ninety-eighth streets, 100 feet west of Ninth avenue, owned by the city, and will consist of two pumping engines, stand-pipe and tank, with necessary fixtures and buildings, and the pipes to effect the proper distribution of water. The cost is limited to $220,000, to be paid out of the moneys heretofore appropriated by the Legislature for laying pipes, and for other works necessary to improve and extend the distribution of Croton water. A contract for the excavation and foundations has already been made, and the remainder of the work will be contracted for at an early day. The completion of the works will require about one year. They will be of ample capacity to furnish, in conjunction with the present high service works, a full supply at all those points in the upper part of the city at which the pressure from the ordinary service is now deficient.

The work of laying Croton water pipes continues very rapidly, as will be seen by the statement of the Engineer-in-Charge of the Bureau: 23¼ miles of pipes were laid in 1878; 57¾ miles during the past three years; 145 miles during the past ten years; and 235 miles since Jan. 1, 1860.

The total length of pipes now in use is 463 63-100 miles.

In 1878 the following fire-hydrants were set:

	429 5-inch barrel hydrants.
	324 3½-inch barrel hydrants.
	118 3-inch barrel hydrants.
Total.....	871 fire hydrants.

The total number of fire-hydrants now in use is 5,024.

Since the cold weather set in we have the most palpable proof that the pernicious practice of wasting water to prevent freezing in the pipes has been resumed to the fullest extent. The city reservoirs have been reduced at the rate of 6 to 8 million gallons per day over and above the quantity delivered by the aqueduct, and the loss in pressure in the pipes is so great as to cause actual discomfort in many localities. Our winters are not so severe that the service pipes leading from the mains to and through the houses could not be made safe from frost by a little more care and expense. Unfortunately, however, the placing of these pipes is under no official control, and the practice of letting water run day and night to prevent freezing is so cheap and convenient that it is preferred, and is carried on for days and weeks when the temperature is not so low as to cause freezing even in ill-protected pipes.

Other cities provided with similar water systems are subject to the same experiences. In Brooklyn the waste of water and inadaquacy of supply are subjects of complaint as often as the mercury indicates freezing temperature. In Boston, during the coldest weather in January, the increase in the consumption of water was thirty per cent. over the daily average, and the Water Board has issued a notice to the citizens, stating that the effect of such waste was to deprive the higher grounds and upper stories of high buildings on low grounds of the necessary supply; urging upon all the necessity of preventing waste, and threatening strict execution of the city ordinances if the matter complained of be not remedied at once.

Against such general waste as is herein referred to the house inspections are but a partial remedy, as the greatest waste occurs at night, and after houses are closed, when no inspection can take place.

Meters have been placed along the river fronts, in stables, and in many places where the consumption of water is great, and this method of suppressing waste should be further continued and extended. It is not to be denied, however, that an immense waste of water occurs in dwelling-houses, where, on account of the great number, it has been considered objectionable to apply meters; indeed, such application is not authorized by law.

For the suppression of waste, a stringent law should, in my opinion, be passed, as an amendment to the building laws, requiring that all service pipes shall be placed and protected against frost, in such manner as the Superintendent of Buildings may direct. A small outlay in each house might thus be the means of saving to the city a vast sum, for procuring an additional supply of water, and at the same time save the householder from the inconvenience and damage of frozen and bursting pipes. For all buildings hereafter to be erected, there is no reason why such regulation should not be enforced; and considering the great importance and exigency of the case, the law should be made to apply to existing buildings; indeed, such application is essential, if the desired result is to be attained.

During the year 55,386 buildings were inspected, in which were found 10,249 leaks in fixtures, and 881 cases of waste by leaving faucets open.

Aside from the effect of waste, the growth of the city in population, and the increase in size and extent of water pipes, without a corresponding increase in the capacity of the only supply conduit—the Aqueduct—have necessarily greatly diminished the pressure.

The area of the interior of the Aqueduct is 53 34-100 square feet. In 1850 the population of New York was 515,000; the area of the pipes leading from the distributing reservoir was 19 5-100 square feet, and the daily supply 40,000,000 gallons. In that year the Croton Aqueduct Board reported "that the last drop of water which the works in their present state can supply is now delivered in the city."

In 1860 the population was 805,658, and in 1863 the daily consumption of water was 54,400,000 gallons, and the Croton Aqueduct Board reported it unsafe to increase the flow of water in the Aqueduct.

In 1870 the population was 942,000, the area of supply pipes 38 71-100 square feet, and the daily consumption 77,000,000 gallons. The summer season was very dry, and led to the purchase of rights to draw from natural lakes in the Croton basin.

In 1875 the population was 1,042,000, the area of supply pipes, 59 19-100 square feet, and the daily consumption, 95,000,000 gallons.

The area of pipes is now increased to 74 square feet. The average consumption last year was 93,400,000 gallons per day. To keep the consumption within the capacity of the Aqueduct, the gates through which the water passes into the distributing mains can only be partially opened. A twenty-inch main now leads from the Aqueduct at Fordham to supply portions of the Twenty-third and Twenty-fourth Wards.

To the regular population of the city must be added a floating population of at least 50,000, and about 200,000 more from neighboring towns, who carry on business here during the day.

The question of additional conduit capacity thus suggests itself more forcibly from day to day.

THE BRONX RIVER.

The project for obtaining an additional supply from the Bronx river and the Rye ponds, as presented in my report for the quarter ending June 30, 1878, appears the most feasible, advantageous, and economical at this time. At an estimated expense of $1,250,000 it will furnish a supply of 10,000,000 gallons per day, with the additional advantage of having the water delivered at an elevation of 50 feet above the level of the present aqueduct.

The city is growing, and the demand for additional mains and a full supply of water must be answered. But this is not a time to undertake any work for this purpose, involving an expense of many millions, if it can possibly be avoided. The Bronx project will add one-ninth to the present supply. The cost is comparatively small, and the work can be completed in a short time. My opinion is that it should be carried into execution, and that the additional supply thus secured, together with continued measures to suppress waste, will meet the wants of the city for some years to come, and until the time when a greater work may be undertaken. The conduit from the Bronx will forever remain a valuable part of our water system, and will particularly be of great service to the upper wards, which may be expected to increase rapidly in population during the next five or ten years.

THE HOUSATONIC RIVER.

The engineers engaged during the past season in making surveys of the Housatonic river having completed their examinations in the field, and made good progress in the plans and estimates, I am enabled at this time to present to you some definite information as to the practicability and probable expense of diverting the water of that river into the Croton, with the view of supplying, at a future day, when necessary, a new aqueduct of large capacity from the Croton basin.

Three separate lines have been surveyed, by which it is practicable to draw one hundred million gallons of water daily from the Housatonic to the head of the Croton. By two of these routes the water will flow by gravity, and by the third it requires to be pumped to a considerable elevation.

First.—The initial point is a little north of Falls Village, and just below the dam of the Housatonic Railroad Company, at an elevation of 622 feet above tide, where the water is to enter an open canal following the Salmon Brook to a ridge dividing the watersheds of the Housatonic and the Ten-mile river, which has to be pierced by a tunnel 2½ miles long, after which natural water-courses can be used for a distance of more than eight miles, crossing from Connecticut into the State of New York and continuing to Leedsville, where the elevation is 460 feet above tide. From this point an artificial canal again becomes necessary, following the hillsides, on a descent of one foot per mile, to a point near South Amenia, where, bearing to the westward, it crosses the confluence of the Wassaic and Weebatuck creeks (which form the Ten-mile river) at an elevation of 38 feet, and the Harlem Railroad at an elevation of 15 feet; thence the canal runs down the valley of the Ten-mile river and along the valley of the Swamp river to Pawling, where it enters the headwaters of the Croton.

The whole distance is 41 13-100 miles, including 30 19-100 miles of open canal, 2 1 2 miles of tunnel, and 8 44-100 miles of natural water-courses.

Second.—The other two routes are identical from the headwater of the Croton to a point opposite Bull's Bridge, on the Housatonic. Above Bull's Bridge, the second route follows the valley of the Housatonic to a point near West Cornwall, where it receives the waters of the Housatonic. From the point of coincidence of the two routes to the head of the Croton, a ridge is crossed by a deep cut, two ravines are crossed, being respectively 850 and 700 feet between the grades, and 37½ feet and 98 feet in depth.

The Ten-mile river is crossed a distance of 1,500 feet between grades, at an extreme elevations of 126 feet; and the Harlem Railroad is crossed 7 feet below the track. The West Cornwall route is 26 8-10 miles long, consisting entirely of canal, and delivers the water into the Croton by gravity alone. To turn the water of the Housatonic into it, a dam 10 feet high will have to be constructed.

Third.—The third route, starting from Bull's Falls on the Housatonic is the shortest, being only 14 77-100 miles long. But the water will have to be raised by pumping a height of 106 feet to the head of the canal, whence it will flow by gravity in an open channel to the Croton river.

It was at first supposed that the pumps might be operated exclusively by water-power; but at low water the power would not be adequate to raise 100,000,000 gallons per day 106 feet. Steam-power would therefore have to be used altogether, or as auxiliary to the water-power.

The area drained by the Housatonic river, according to the data at command, is as follows:

Above Falls Village, 631 square miles.
Above West Cornwall, 709 square miles.
Above Bull's Bridge, 790 square miles.

The rainfall from May 22 to November 1, a period of a little more than five months, was 17 96-100 inches.

The average daily flow of the Housatonic river for the season was 300,000,000 gallons; the maximum, 470,000,000 gallons, and the minimum, 170,000,000 gallons.

In seasons of great drought the flow would be much reduced.

The line of canal above briefly described is located in part through a broken country, and for several miles at a considerable elevation above the level of the streams, along steep hillsides; and the work of construction would be very expensive. The detailed estimate is not yet completed; but from the information at command, the cost of either plan may be stated in round numbers at two and a half millions of dollars, including water rights on the Housatonic.

It must be understood that this estimate merely provides for leading the Housatonic waters to the Croton basin, whence they must be conducted to the city by a new and large aqueduct, probably on the route surveyed during the administration of my predecessor, Gen. Porter.

When the maps, plans, and estimates are completed, and the detailed report of the engineers presented, I shall make a final report upon this subject. These documents being placed upon record in the Department, will prove interesting and useful, when, at some future day, the question of the best means of obtaining a large additional supply of water for this great city must be definitely considered and decided.

REMOVING OBSTRUCTIONS IN THE CROTON RIVER.

The same party of engineers who surveyed the Housatonic also examined the east branch of the Croton, in Putnan and Dutchess Counties, with the view of removing certain obstructions in the stream, which dam the water and cause it to flow very sluggishly through large swamps in the towns of Paterson and Pawling. A more rapid current would be maintained, and the purity of the water improved, by removing these obstructions, which consist of rock, hard pan, and fallen trees.

The whole cost would not exceed fifteen thousand dollars. This work, or part of it, can be done during the coming season, and paid for out of the fund already authorized.

LIGHTING THE CITY.

The total length of gas mains in the city on the 31st of December, 1878, was 812 miles, of which there were laid during the year 1878, 85½ miles.

The average number of lamps burning and the total expenditures of all kinds by the Bureau of Lamps and Gas for the past five years were as follows:

Year.	Average number of lamps burning.	Total expenditures of Bureau.
1874	20,047	$757,009 60
1875	20,028	741,150 52
1876	20,159	679,349 10
1877	21,203	632,576 24
1878	21,419	498,801 56

The cost of lighting the city and public buildings during the year 1878 was less than for any year since 1863, although there has been an increase since that time of about 6,000 lamps, and some additional expenditures during the past year for lighting armories and drill-rooms heretofore borne by the regiments.

At the letting of contracts for lighting street lamps, on May 1, 1878, the gas companies south of Harlem river reduced their rates about 30 per cent. In the wards north of the Harlem river the prices cannot be reduced until the expiration of existing contracts, January 1, 1881, when a considerable saving will be effected.

The appropriation asked for by this Department, and authorized by the Board of Estimate and Apportionment for lighting the city during the year 1879, is based upon the bids accepted by the Gas Commission at the award of contracts in April last, and upon the use of burners consuming three cubic feet of gas per hour, which standard was adopted for street lamps when gas was first introduced in the city, and has been continued, without variation, to the present day. The advantages of a well and even brilliantly lighted city, in respect both to safety and ornament, are so manifest that I would respectfully suggest the consideration of an increase of 33⅓ per cent. in the size of burners from and after the first of May, 1880. It cannot be done before that time, as the appropriations are already made for the year 1879. The cost of lighting the city is much less than for many years past, and, considering the number of lamps in use, far less than at any time since the introduction of gas; yet, in view of the heavy burden of taxation, I am reluctant to propose any increase of expenditure except for useful and necessary purposes. I believe, however, that the advantages to be derived from well-lighted streets will warrant the additional outlay, and that the change will meet with general approval. Burners consuming four cubic feet of gas per hour, instead of three feet, as at present, will add more than 33⅓ per cent. to the amount of light, as the illuminating power increases with enlarged burners in a greater ratio than the consumption.

From actual measurement made at our photometrical rooms, it is found that a four feet burner gives 43 36-100 per cent. more light than one of three feet, and that one four feet burner gives nearly 25 per cent. more light than two of two feet each.

In comparison with many cities of this country and Europe, New York must be pronounced a poorly lighted city.

Chicago has four feet burners—lamps 125 feet apart.
Boston has four feet burners.
Philadelphia has six feet burners—variable.
Baltimore has five feet burners.
Washington has six feet burners—lamps 150 feet apart.
Buffalo has four feet burners—lamps 125 feet apart.
St. Louis has five feet burners—lamps 150 feet apart.
Liverpool has four feet burners—lamps 180 feet apart.
Manchester has four feet burners—lamps 150 feet apart.
Paris has three and a-half to seven feet burners—lamps 117 feet apart.
New York has three feet burners—lamps 100 feet apart.

There are certain expenses, such as lighting, extinguishing, cleaning, glazing, painting, etc., etc., which will not be affected by enlarging the burners, so that the increase of cost will only be what is due to the additional amount of gas consumed.

On the basis of the present number of lamps and existing rates, the following is the estimated cost of substituting four feet burners for those of three feet, increasing the consumption of gas 83⅓ per cent., and adding 43⅓ per cent. to the amount of light.

For all that part of the city south of Seventy-ninth street, in which there are 14,416 lamps, the additional cost would be $49,827.

For all that part of the city south of Harlem river, in which there are 18,786 lamps, the additional cost would be $74,420.

And for the whole city (21,539 lamps), the additional cost would be $112,670.

Two years hence, when existing contracts in the Twenty-third and Twenty-fourth Wards expire, this additional sum of $112,670 for substituting four feet burners throughout the whole city, will be materially reduced.

Until the population increases in the upper part of the city, the change of burners might be confined to the district below Seventy-ninth street.

If five feet burners were adopted below Seventy-ninth street, the present amount of light in the street lamps would be doubled, at an additional cost of only $100,000 per annum.

At a time when the subject of improving the lighting of cities is so much discussed, I venture to suggest that the simple method by which the light in the most densely populated part of New York may be doubled, at a cost so comparatively small, is not unworthy of consideration.

I have brought this subject thus early to your notice, in order that it may be duly considered before the appropriations for the year 1880 are adopted.

My attention has been called within the past year to the necessity of rearranging the time table for lighting and extinguishing the street lamps, so that as nearly as possible all shall be lighted before the darkness of night sets in, and that they shall not be extinguished before the full dawn of day. The contracts for lighting the city for the past twenty-five years, have required that each lamp shall be kept burning 3,833 ½ hours in the aggregate during the year, an average of 10½ hours for each night, the actual number of hours being increased or diminished according to the season, as established by a time table, and varying from 13½ hours in the longest nights of winter to 7½ hours in summer.

It seems that the aggregate number of hours (3,833 ½) in which each lamp is to be lighted per annum, was not arrived at by any astronomical calculation, as might perhaps be inferred from the preciseness of the figures, even to a fraction, but by the more simple process of the rule of three direct, and in this wise:

In 1848 the contract for lighting with gas required that the public lamps should be lighted at the rate of $15 each per annum, according to a time-table which then aggregated 2,300 hours for the year, the lighting having been omitted on moonlight nights, or when, according to the almanac, the moon should shine.

The contracts, however, contained a provision that if the number of hours should be increased, a pro rata increase of price should be allowed.

In January, 1854, the Common Council directed the Commissioner of Streets and Lamps "to cause all the public lamps throughout the city to be lighted from dark until daylight every night throughout the year."

The Commissioner having determined that the price for lighting each lamp must be limited to $25 per annum, the calculation was made that if $15 would light a lamp 2,300 hours per annum, then $25 would light it 3,833⅓ hours, and that number was adopted for the time-table, and has been continued to the present day, "all the lamps to be lighted within one hour from the time of beginning to light." The time occupied in lighting and extinguishing leaves some lamps unlighted until after dark, and causes some to be extinguished before daylight, though the total number of hours is maintained at 3,833 per annum. If all the lamps could be simultaneously lighted and extinguished by electricity, it is evident that the whole city might be lighted from dark until daylight in a minimum number of hours; but as this is not practicable (at least at present), the desired result may be approximately obtained by requiring the lighting and extinguishing to be done in thirty minutes instead of one hour, as at present. This may slightly increase the cost of lighting.

Though the number of hours in which the lamps are lighted yearly seems to have been arbitrarily arrived at, yet it probably covers pretty nearly the period from dark until daylight, provided no time, or at least only a brief time, be consumed in the lighting and extinguishing.

The hours of burning per annum in some of the larger cities are as follows:

Brooklyn	3,556 hours.
Boston	3,828 "
Philadelphia	3,939 "
Glasgow	3,711 "
Liverpool	3,620 "
Manchester	3,666 "
Paris	3,749 "
New York	3,833⅓ "
London	4,300 "

Local conditions of the atmosphere will, of course, to some extent, govern the number of hours in which artificial light may be required. Mr. Stephen McCormick, the Superintendent of Lamps and Gas, who has given the subject careful consideration, estimates the time in which the lamps should be lighted in this city at 4,000 hours per annum. His report, to which I would respectfully refer, contains interesting views and statistics on this and other matters connected with the lighting of the city.

Mr. McCormick's report, and that of Mr. E. G. Love, Gas Examiner, in charge of the photometrical rooms, contain interesting statements on the subject of the electric light, to which I invite your attention.

The objections at present to this light for street illumination may be briefly stated as follows:

First.—Its intensity is not necessary, nor desirable for this purpose. This method, until some practicable mode of subdivision is devised, would necessitate one great centre of light, where now the light is more thoroughly diffused by many smaller ones. The intensity of the sun's rays is not observed, because they are parallel and greatly diffused, but in the case of the electric light, emanating from a single point not very distant, the strain upon the eye would be injurious.

Second.—The liability to sudden extinction by injury to the machines, and interruption of the electric current. This objection in street lighting is more serious than in any other application of the electric light. In buildings, oil and candles might be temporarily and quickly substituted, but sudden and continued darkness in the streets of a great city can not, under any circumstances, be hazarded. Extra plant might be supplied, but, as many machines would be required, an entire duplication would be out of the question. This objection does not apply to gas, a supply being stored up for an emergency.

Third.—The cost. At present the electric current cannot be conducted to any great distance without considerable loss. This would necessitate a great many generating machines, and suitable places to locate them could only be obtained at great cost. From extensive experiments made in Paris, it has been found that the electric light costs much more than an equal amount of gas light. It would be unwise to say that these obstacles may not be overcome, but whatever may be accomplished in the future by the discoveries of electricians and the genius of inventors, in respect to this method of illumination, at present it does not seem applicable, in a practicable and economical sense, to the lighting of the streets of the city.

DEPARTMENT OF PUBLIC WORKS,
BUREAU OF LAMPS AND GAS,
NEW YORK, January 4, 1879.

Hon. Allan Campbell, Commissioner of Public Works:

Sir—In compliance with the directions contained in your circular letter of 5th ultimo, I herein submit a report of the transactions of the Bureau of Lamps and Gas for the quarter ending December 31, 1878, with a summary of the same for the entire year.

The following shows the average number of lamps burning in each of the years from 1872 to 1878, both inclusive:

By what Gas Company.	Average Number of Lamps Burning in—						
	1872	1873	1874	1875	1876	1877	1878
New York	3042	3025	3008	3009	2638	2890	3148
Manhattan	6870	6758	6546	6550	4996	5954	6618
Metropolitan	3936	4002	3582	3514	3633	3767	3890
N. Y. Mutual	.....	.....	440	584	2516	1323	587
Harlem	4040	4097	4024	3915	3938	2554	3960
N.Y.&N.J.Globe	.....	.....	.....	.....	.....	2106	506
Central	.....	.....	1523	1524	1536	1569	1649
Northern	.....	.....	924	932	932	969	989
Yonkers	.....	.....	.....	.....	.....	71	72
Totals	17888	17882	20047	20028	20159	21203	21419

Gas mains have been laid by the several gas light companies during the year as follows:

	Feet.		Miles.	Feet
New York	8,354	Total miles laid Dec. 31, 1878	110	2,316
Manhattan	886	" " "	173	1,774
Metropolitan	10,240	" " "	127	3,365
New York Mutual	80,032	" " "	114	1,459
Harlem	22,400	" " "	112	1,161
Central	17,310	" " "	40	1,470
Northern	1,320	" " "	21	3,960
Yonkers	.....	" " "	4	1,161
Municipal	48,787	" " "	58	1,124
Knickerbocker	261,721	" " "	49	3,001
Total length of gas mains in city Dec. 31, 1878			811	4,951
Total length laid in 1878, 85 miles 2,311 feet.				
The New York Gas Company has taken up during the year			6.607 feet.	
The Mutual " " "			10.234 "	
The Harlem " " "			3.079 "	
Total taken up during the year			19.920 feet.	

The following statement will show the prices now paid for supplying the gas to and lighting, extinguishing, cleaning, and reglazing the public lamps for the year ending April 30, 1879, with the prices for the corresponding period of last year:

GAS COMPANY.	Price per Lamp, May 1, '78, to Apr. 30, '79	Price per Lamp. from May 1, 1877, to April 30, 1878.	Saving per Lamp by present contracts.	
New York	$12 00	$17 02 2-9	$5 02 2-9	
Manhattan	12 00	17 02 2-9	5 02 2-9	
Metropolitan	19 50	25 56 2-3	6 06 2 3	
N. Y. Mutual	16 65	27 77 2-9	11 12 7-9	
Harlem	21 00	29 90	8 90	
N. Y. and N. J. Globe	20 00	.....	.....	
Yonkers	33 00	33 00	.....	
Central	*45 00	45 00	.....	
"	35 00	35 00	10 00	New Lamps.
Northern	*50 00	50 00	.....	
"	42 50	42 50	7 50	New Lamps.

* These contracts were made by the town officers of Morrisania and West Farms prior to annexation of these towns to this city, and the contracts do not expire until January 1, 1881; a reduction, however, as shown above, has been obtained on all new lamps erected since annexation.

The following statement will show the figures named in the several proposals for furnishing gas to such of the public buildings as are under the care of this Department, for the year 1879, which were received by you on December 9, last, also the illuminating power of the gas proposed to be furnished, and the amount of gas consumed in these buildings during the year 1878:

BY WHAT GAS CO.	Consumption of Gas in 1878.	Candle Power for 1879.	Price Bid for 1879, per 1,000 cubic feet.	
*New York	6,357,450	16	$1 90	
*Manhattan	3,965,200	16	1 90	
Metropolitan	358,320	16	$1 75 2 00	For 50,000 ft. and over in 1 mo. For less than 50,000 ft. in 1 mo
N. Y. Mutual	257,340	19	2 00	
*Municipal	....	20	1 90	
*Harlem	353,255	16	2 00	
Total cubic feet	11,291,565			

* Contracts were awarded to and have been made with these companies.

The price per thousand cubic feet of gas charged to private consumers by each gas company is as follows:

New York Gas Light Co	$2 50
Manhattan Gas Light Co	2 50
Metropolitan Gas Light Co., for over 50,000 feet in one month	1 75
" " for less than 50,000 and over 30,000	2 00
" " for less than 30,000 feet in one month	2 25
New York Mutual Gas Light Co	2 50
Municipal Gas Light Co	2 40
Harlem Gas Light Co	2 00
Central Gas Light Co	2 50
Northern Gas Light Co	3 00
Yonkers Gas Light Co	2 85
Knickerbocker Gas Light Co., when ready to supply	2 00

This last named company has completed the works at Ninety-eighth street, East river, which were erected by the late Union Gas Light Company. It proposes to manufacture gas by a process new in this city, and I am informed that it expects to send out gas during the present month.

The total expenditure of the Bureau of Lamps and Gas for 1878 was less than that of any of the previous years since 1863, notwithstanding there is an increase of nearly 6,000 lamps over the year 1863, and notwithstanding the additional duties imposed on this Bureau by "acts of the legislature." First—chapter 613, Laws of 1873, the Annexation Act, placed the lighting of the Twenty-third and Twenty-fourth Wards; and chapter 304, Laws of 1874, the Consolidation Act, placed the care of the county buildings under this Department, and chapter 275, Laws of 1878, the Military Code, imposes upon us the duty of lighting the armories of the National Guard located in this city.

The following is a comparison of the prices paid in 1878, with those paid in 1876, for the various supplies required by this Bureau:

	Price Paid, 1876.	Price Paid, 1878.
Lamp posts	$10 80	$7 39
Cross heads	1 50	95½
Square lamp irons	1 00	74
Round lamp irons	1 00	60
Globe lamps	6 50	4 75
Lamp Globes	2 25	2 00
Square Street-lamps	*3 00	**3 00
Glass Street-signs	†20	††17½

* Two cross tin.
† Single-thick, 2½ inches in width.
** Two cross tin, copper rims.
†† Double-thick, 3½ inches in width.

The following will show the average maximum and minimum pressure on the mains of the above companies, during the quarter, as recorded on the pressure registers in the photometrical rooms; this average being made for the time during which the public lamps are required to be lighted, and hence does not include the day pressure:

Of what Gas Co.	Average Maximum Pressure.	Average Minimum Pressure.	Where Taken.	Distance from the Gas Works.
	Inches.	Inches.		Miles.
New York	1.70	1.35	Grand and Centre sts.	2.04
Manhattan	2.20	1.24	" "	1.33
N. Y. Mutual	2.16	1.49	" "	1.79
Metropolitan	1.50	.94	79th st., bet. 2d and 3d avs.	3.33
Harlem	2.95	1.93	79th st., bet. 2d and 3d avs.	1.75

No tests or records can now be made of the gases supplied by any of the other gas companies, because there are no mains in the vicinity of the photometrical rooms from which the gas can be obtained.

ARMORIES AND DRILL ROOMS.

In accordance with chapter 275, passed May 18, 1878, the bills for gas supplied to the armories of the National Guard since said date have been paid on vouchers audited and passed by this bureau. Prior to the passage of this law, these bills were paid by the several organizations out of their regimental funds, and hence there was an inducement on the part of the commanding officers to see that proper economy was exercised by janitors, armorers, and others, in the burning of the gas, and that no unnecessary waste was permitted. Now that the bills are paid by the city this incentive may cease to exist, inasmuch as the regiments have no pecuniary interest at stake, and hence no thought or attention may be given to the matter. This result, it would seem, is already taking place, as will appear from the increased consumption of gas during the past three months as compared with the amount consumed during the corresponding period of 1877, the consumption in 1877 having been obtained from the books of the gas companies. The following figures show the increase:

Gas consumed during 3 mos. ending Dec. 31, 1878	1,023,980 cu. ft.
" " " " Dec. 31, 1877	567,400 "
Increase of consumption during 3 mos. of 1878	456,580 cu. ft.

It will be seen from the above that there is an increase of nearly half a million cubic feet in three months only. I find by an examination of the separate bills that an increase exists in every armory except one, and this exception shows a decrease of 300 cubic feet.

In view of the foregoing figures I desire to call the attention of the commanding officers of the several regiments to the matter, with the hope that proper steps may be taken, whereby some degree of care and economy may be exercised in the future. I desire also to call attention to the fact that these armory buildings are frequently used for purposes other than those coming under the Military Code. We find that balls, concerts, and fairs are frequently held in them; in fact, one of the buildings was occupied as a fair during almost the entire month of December.

The act of the Legislasure which imposes the duty of lighting the armories upon the city is the "Military Code," and refers to military affairs only. It is quite evident that the cases mentioned above have no connection with military affairs, and it seems to me that the Legislature had no intention of imposing the payment of such gas bills upon the city. The question may, perhaps, be considered by some persons as a small matter, but the aggregate amount of gas consumed in the course of a year, as well as fuel, will figure up a considerable sum, and the regular bills alone, will add, at least, seven thousand dollars to the annual expenditure of this department. As the lighting of the armories has but lately come under the care of this bureau, this seems to me the appropriate time to mention the subject, and I think it desirable that some rule or ordinance should be established whereby the expense for gas consumed on occasions other than military shall not fall upon the taxpayers of our city.

STREET LAMP BURNERS.

In my report under date of December 31, 1876, I referred to the fact that the gas burners in use in the public lamps in this city were of the same capacity as those originally introduced in the early days of its gas lighting, when the streets were few and but sparsely built upon, their consuming capacity being but three feet per hour. I then expressed the opinion that the comfort, convenience, and protection of the people required that a well-regulated city should provide, at least, well-lighted thoroughfares. Being extremely desirous, however, of not only avoiding any increase in the expenditure of this department, but of reducing the expense where possible, I hesitated to recommend the adoption of a larger burner. Since that suggestion was made the cost of lighting our public lamps has been greatly reduced, and the prices now obtained are lower than any ever before paid in this or any other city in this country.

In view, therefore, of the very great reductions which have been made, and from the fact that the street lamp burners of this city are smaller than those of nearly all the other cities of this country or Europe, as will be seen by the figures shown in Exhibit "E," it seems to me eminently proper that the matter of adopting a large burner might now be earnestly considered; as there can be no question but that a large gas flame in each of our street lamps will very materially add to the protection of the people and serve as a valuable adjuct to the police. In order that the Common Council and the Gas Commission may clearly know the additional expense which would be incurred by the substitution of a four foot burner in lieu of the present three foot burner, I have prepared the following statement showing the extra cost for the lamps south of Seventy-ninth street, the cost for all on Manhattan Island, and the total extra cost for the entire city.

[Statement showing the additional cost of the substitution of a four foot burner in lieu of present three feet burners, based on a lighting of 3,833⅓ hours per annum at existing rates:]

Gas Company.	Number of Lamps.	Present Rate for 3 ft. Burners	Proportionate Rates for 4 ft. Burners.	Increase per Lamp.	Total Increase.
New York	3,219	$12 00	$16 00	$4 00	$12,876 00
Manhattan	6,655	12 00	16 00	4 00	26,620 00
Metropolitan	3,955	19 50	26 00	6 50	25,707 50
New York Mutual	587	16 65	22 20	5 55	3,257 85
Total south of 79th street					$68,461 35
Harlem	3,860	21 00	28 00	7 00	27,020 00
N. Y. and N J. Globe	510	20 00	26 66⅔	6 66⅔	3,400 00
Total for Manhattan Island					$98,881 35
Yonkers	72	33 00	44 00	11 00	792 00
Central	1,506	45 00	60 00	15 00	22,590 00
"	175	35 00	46 66⅔	11 66⅔	2,041 66
Northern	932	50 00	66 66⅔	16 66⅔	15,533 33
"	68	42 50	56 66⅔	14 16⅔	963 33
Total for entire city	21,539				$140,801 67

The statement has been divided into three parts, in order that a clear understanding may be had, as it might not be thought advisable to place new burners in all the lamps, but only in those in the built up and thickly settled sections of the city.

As the appropriation for Lamps and Gas for the year 1879 has been finally determined by the Board of Estimate and Apportionment, and as the estimate was based upon the prices paid in 1878, for three feet burners, of course the amount of the appropriation will not admit of any increase during the current fiscal year. There will, therefore, be ample time for the consideration of the matter, and if it should be deemed desirable to make the change, then the estimates for the next fiscal year can be based accordingly.

HOURS OF LIGHTING.

During the past year my attention has several times been called to the necessity of increasing the number of hours during which the street lamps should be lighted in the course of a year. The number of hours of burning is now 3,833⅓ hours, and this number was arrived at in the following manner: The contract with the Manhattan Gas Light Company, dated May 5, 1848, required that the public lamps should be lighted at the rate of $15 each per annum, according to a table which then aggregated 2,300 hours the year, the lighting of the lamps having been omitted on moonlight nights

or during the times when the almanac stated that the moon ought to shine. The contract, however, contained a provision that if, at any time during its continuance, the number of hours of lighting should be increased, then, in that case, an additional compensation should be allowed equivalent to a pro rata increase of the price fixed, proportioned to the increased number of hours. On the third day of January, 1854, a resolution of the Common Council was approved by the Mayor, which directed the then Commissioners of Streets and Lamps, "to cause all the public lamps throughout the city to be lighted from dark until daylight every night throughout the year." On the adoption of this resolution the gas companies were notified to that effect, but the Commissioner informed the company that the city did not wish to pay a greater sum than $25 per annum for each lamp. A calculation was then made that if $15 would light one lamp 2,300 hours, how many hours would $25 light, which, of course, was 3,833⅓ hours; and this number was then agreed upon, and has been maintained yearly since that date.

It is now claimed that this number does not fully answer the purpose of affording sufficient light to the streets, either during the evening or early morning. The assertion is made that very many of our people are compelled, by the several avocations, to be upon the streets at a very early hour in the morning, say, from one to two hours before sunrise, the year round, and that gaslight is more essential during these hours than during the one or two hours after midnight, when but few people are compelled to be upon the streets. That this statement is correct there can be no question, for we well know that our grocers, bakers, butchers, milkmen, and many people of other avocations are forced by their business necessities to commence operations at a very early hour, while most of the people on the streets during the hour or two after midnight are probably there from choice rather than necessity.

Deeming the matter, therefore, worthy of consideration, I have taken up the present time-table and compared it with the time of the daily rising and setting of the sun, with the view of ascertaining where the defects, if any, existed, and how to apply the remedy.

By a careful calculation for each day in the year, I find that the total number of hours between sunset and sunrise is forty-three hundred and four hours and four minutes, showing an excess of four hundred and seventy hours and forty-four minutes over our time table.

The table shows that the commencement of lighting begins, say from one minute before sunset to fifteen minutes after sunset, and extinguishing time begins from fifty-five minutes to one hour and twenty-five minutes before sunrise, according to the season of the year.

By daily observations of the gradual approach of the night's darkness and the dawn of morning, noting also the condition of the weather, I find that the average duration of time between sunset and the shades of night, or from sunset until the evening is darkened to such an extent that the lighting of the lamps should all be completed, is from thirty-five to forty-five minutes, although the darkness of the night is not complete until some ten or fifteen minutes later.

By the table the lamplighters are allowed *one hour*, within which all the lamps must be lighted; hence we find that there is from fifteen to twenty-five minutes of almost complete darkness before the lighting of the last lamp has been concluded; or, say that three-fourths of the lamps are lighted during the evening twilight and one-fourth after the darkness of night.

This defect can easily be remedied by postponing the commencement of lighting until ten minutes after sunset, and then requiring that all the lamps shall be lighted within thirty minutes from the time of beginning; thus all the lamps will have been lighted within forty minutes after sunset and before the darkness of the night has completely covered the city.

In regard to the morning hour we find that the streets are not sufficiently lighted by the natural light of the dawning of the day, or by the gradual reflection of the light from the sun, as it is slowly and surely approaching the horizon, until from thirty-five to forty-five minutes before actual sunrise; hence the extinguishing of the lamps should not be commenced until from thirty-five to forty-five minutes prior to sunrise.

By the present table we find an interval of from forty to twenty minutes of extreme darkness after the quenching of the lamps has been commenced and before the day begins to dawn.

It is therefore evident that gaslight is required to be maintained in all our street lamps until within from thirty to forty minutes of sunrise, but this our present time table will not permit, and in order that it can be done it is necessary that the number of hours can be increased to four thousand per annum.

That the additional expense which would necessarily be incurred by such increase may be clearly understood, I have prepared the following statement showing the additional expense of lighting the public lamps four thousand hours per annum, based upon a three foot burner, at existing rates and present number of lamps:

Gas Company.	Number of Lamps.	Present Rate for 3,833⅓ Hours.	Proportionate Rate for 4,000 Hours.	Increase per Lamp.	Total Increase.
New York	3,219	$12 00	$12 52 4 23	$0 52 4-23	$1,679 47
Manhattan	6,655	12 00	12 52 4-23	52 4 23	3,472 17
Metropolitan	3,955	19 50	20 34 18-23	84 18-23	3,353 15
N. Y. Mutual	587	16 65	17 37 9-23	72 9-23	424 93
Total south of 79th st					$8,929 72
Harlem	3,860	21 00	21 91 7-23	91 7-23	3,524 35
N. Y. and N. J. Globe.	510	20 00	20 86 22 23	86 22-23	443 48
Total, Man'tan Isl'd.					$12,897 55
Yonkers	72	33 00	34 43 11-23	1 43 11-23	103 30
Central	1,506	45 00	46 45 15-23	1 95 15-23	2,946 52
"	175	35 00	36 52 4 23	1 52 4-23	266 30
Northern	932	50 00	52 17 9-23	2 17 9-23	2,026 09
"	68	42 50	44 34 18-23	1 84 18-23	125 65
Total, whole city	21,539				$18,365 41

Assuming that the rates for all the lamps for the year commencing May 1, 1879, will remain the same as now paid for 3,833⅓ hours, then the total increase for all the lamps south of Harlem river, for 4,000 hours, will amount to $12,897, and for the whole city to $18,365. I might say, in this connection that the number of hours during which the public lamps of this city are kept burning in the course of a year is equal to that of any other city either in this country or Europe, as will be seen by the table hereto annexed, marked "E"

The following statement will show the total increase which would be incurred by the substitution of a four foot burner and 4,000 hours per annum, based upon present prices and existing number of lamps:

Gas Company.	Number of Lamps.	Increase for 4 ft. Burners, 3,833⅓ Hours.	Increase for 4,000 Hours, 3 ft. Burners.	Increase for 4 ft. Burners & 4,000 Hours.
New York	3,219	$12,876 00	$1,679 47	$15,115 29
Manhattan	6,665	26,620 00	3,472 17	31,249 56
Metropolitan	3,955	25,707 50	3,353 15	30,178 37
N. Y. Mutual	587	3,257 85	424 93	3,824 42
Total south of 79th st		$68,461 35	$8,929 72	$80,367 64
Harlem	3,860	27,020 00	3,524 35	31,719 13
N. Y. and N. J. Globe..	510	3,400 00	443 48	3,991 30
Total, Man'tan Island		$98,881 35	$12,897 55	$116,078 07
Yonkers	72	792 00	103 30	929 73
Central	1,506	22,590 00	2,946 52	26,518 69
"	175	2,041 66	266 30	2,396 73
Northern	932	15,533 33	2,026 09	18,234 78
"	68	963 33	125 65	1,130 86
Total for entire city..	21,539	$140.801 67	$18,365 41	$165,288 86

[To be Continued.]

The Mysteries of a Lump of Coal.

For years no one supposed that a lump of soft coal, dug from its mine or bed in the earth, possessed any other purpose than that of fuel. It was next found that it would afford a gas which was combustible. Chemical analysis proved it to be made of hydrogen. In process of time mechanical and chemical ingenuity devised a mode of manufacturing this gas, and applying it to the lighting of buildings and cities on a large scale. In doing this other products of distillation were developed, until step by step, the following ingredients are extracted from it: 1. An excellent oil to supply lighthouses, equal to the best sperm oil, at lower cost. 2. Benzole—a light sort of ethereal fluid, which evaporates easily, and, combined with vapor or or moist air, is used for the purpose of portable gas lamps, so-called. 8. Naphtha—a heavy fluid, useful to dissolve gutta percha, india rubber, etc. 4. An excellent oil for lubricating purposes. 5. Asphaltum, which is a black, solid substance, used in making varnishes, covering roofs, and covering over vaults. 6. Paraffine—a white crystalline substance, resembling white wax, which can be made into beautiful wax candles; it melts at a temperature of 110 degrees, and affords an excellent light. All these substances are now made from soft coal—*Coal Trade Journal.*

The Contract for supplying the Alexandria gas works with coal for the ensuing year has been awarded to Messrs. Sinclair & Agnew.—*Ibid.*

Gas as Fuel.

By "Isca."

I.

Although the chief usefulness of gas has hitherto been considered to lie in those illuminating qualities which will, in all human probability, still constitute its principal claim to public favor in the future, recent events have shown that its possible adaptability as a fuel, to a greater extent than is at present common, has been impressed on the public mind with considerable force.

Among the many conjectures to which the lately threatened subjection of gas lighting by the electric light, in some or all of its new forms, gave birth, not the least remarkable was the anticipation that, although possibly ousted from the chief field of their activity, the manufacturers of gas might easily take a new line, and find not less profit in the factory and the kitchen than erstwhile in the street or the hall; and, amid all the wild expectations as to the Edison light, it was never imagined that it could supersede gas in the less obtrusive path so indicated.

The immediate necessity for thus revolutionizing the character of the work to be done by gas, and consequently also of the nature of the article itself, having failed to become imperative, it will scarcely be profitable to institute any speculative inquiries as to what changes might have been made to meet the requirements of a new era; but, without any undue confidence, it may be assumed that the possibility exists of creating such modifications in the nature of gas from coal as to adapt it to any of the purposes of fuel, to a degree but little suspected even by those who, regarding the matter from the standpoint of the ordinary consumer, were disposed to allow it considerable credit in that respect.

Meanwhile it may be interesting to briefly examine the whole question of the relation of common coal gas, as at present supplied in our towns, to other combustibles generally used as fuel; considering not so much the details of cooking dinners or boiling kettles—plentiful instances of which species of experimental research are advanced by every maker of stoves and kitcheners—as endeavoring to ascertain, in some measure, the ultimate possibilities of the various substances dealt with.

The chemical change in the molecular arrangement of matter which is known as combustion, may be described as the combination of oxygen with other elements in such an energetic manner that the union is accompanied by the manifestation of heat, and sometimes light. Thus, supposing, by way of illustration, that combustion is a product of only two separate factors, we may represent oxygen by its symbol, O, and the other agent by x, and say that combustion is represented by $O\,x\,(n)$; supposing n to be a measure of the energy displayed in the operation. Following up the line of thought thus suggested, it would appear feasible to construct a table of what, for want of a better term, may be called oxidizing affinities, leading up from combustions almost inert to those whose mutual attraction is highest. Unfortunately, such an idea is not practical, the observed facts in reference to the action of oxygen on other bodies not admitting of such rigid classification; so that, although the actual quantity of oxygen necessary to combine with any substance with which it has an affinity, may be determined and catalogued, we should not thereby be put in possession of a useful measure of the energy actually manifested, and capable of being utilized for its thermal effects.

It is this useful effect of combustion—this palpable result—which we want to be able to measure, and it is the default of any inherent index of it in the nature of substances which has led to the general adoption of a standard of measurement known as the "unit of heat," which is an arbitrary quantity represented, in this country, by the change in temperature of one pound of water through one degree of the scale of Fahrenheit's thermometer. As might be expected, from being an attempt to measure a cause by its obvious effect, this is not by any means a thoroughly satisfactory standard, but, inasmuch as it is fairly constant and easily understood, it may well be used in the comparison of results analogous to itself.

Presuming, then, that the useful effect of the combustion of any substance is to be measured by the thermal changes it is capable of causing in a known weight of water, it is not by any means easy to arrange the several parts of what is to be used as a measuring apparatus in such a way as to secure reliable results. When it is remembered that it is so difficult to use such a comparatively simple thing as a measure of length in a perfectly trustworthy manner, that few persons are found to exactly agree in the measurement of any rather embarrassing line—such, for instance, as the base of the Great Pyramid—there is nothing very surprising in the fact that, in the attempt to measure, by the accepted standard, the heating power of one of the simplest as well as most important combustible we have—carbon, for example—results have been obtained which differ with nearly every individual observer.

These and similar considerations have lead some physicists to pronounce the modern science of heat, if it can so be qualified, a mere plausable, but utterly inaccurate string of rules and assumed principles, based on data so inconclusive as to be worthless when treated as material with which to build anything like a substantial scientific edifice.

But while admitting much of this kind of argument to be true, we may yet make use of most of the data which has been laid down, as the observed results of experiments made with great care, and which are, probably, as conclusive as will be desired by those who are content to regard a carfully conducted laboratory experiment as giving a pretty close approximation to theoretic accuracy, when regarded in comparson with the necessarily rougher processes of every day practice.

While regarding the above proposition respecting the average value of those observations which have been already tabulated, and are to be found in every Manual on Heat, it is impossible to avoid comment on the considerable difference in the statements of various competent authorities respecting the experimental value of certain very important combustibles. Thus the following table exhibits in an obvious manner the glaring discrepancy of results, of which considerable capital is sometimes made:

Pounds of Water Heated 1° *per Pound of Substance Burnt*—

Substance.	Authorities.				
Elements.	Andrews.	Dulong.	Letheby.	Clement.	Despretz.
Carbon.....	14,220	12,906	14,544	—	14,040
Hydrogen.....	60,854	62,535	62,030	39,807	42,552
Compoounds.					
Carbonic oxide	4,376	4,478	4,325	—	—
Marsh gas.....	23,596	—	23,513	—	—
Olefiant gas....	21,495	—	21,344	—	—

A few only of the constituent substances in common use, either in the form of solid or gaseous fuel, are given, but the list might be extended to include oils, wood spirit, etc. Enough, however, may be gleaned from those given to show that the very alphabet of heat is in a singularly indeterminate condition, and that there is ample scope for further investigations into this important question. When the absolute values of carbon and hydrogen are ascertained, the effects of all combustibles may be readily ascertained by computation. This has repeatedly been done, and the values so obtained have been so far verified by direct experiment as to show that it is perfectly safe to adopt such a mode of procedure.

Returning to the two elements of hydrogen and carbon, it seems almost incredible that, whereas Clement only made its heating power 39,807 units per pound, Dulong should have found it 62,535 units; but inasmuch as the latter result has been closely approached by Letheby and Andrews, not to mention other observers, we may take 62,500 units per pound to be a fair expression of its value. In the case of carbon, to which Letheby assigns 14,544, and Dulong only 12,906, the weight of evidence is again in favor of the higher number, and we may therefore conclude 14,500 to be about the value of its ultimate effect.

It is not to be supposed that these results are to be expected in general practice; they only serve to show what is possible to be obtained under proper conditions. As a matter of fact, the best burners or furnaces in practical use do not give results approaching the theoretic possibilities of the fuel with which they are fed.

In some measure this is practically inevitable, but, to a great extent, improvement is very practicable. One great cause of waste is the necessity of allowing the products of combustion from the fire to pass off, by the chimney, at a temperature considerably higher than that of the air admitted to the fuel, without which there could be no draught. Then it is practically impossible to ensure the heat evolved being absolutely confined to the work required of it, a large proportion being always dissipated by radiation, both from the fire box and from every portion of the boiler, or other recipient of the heat, which is exposed to a lower temperature than its own. And it is also impracticable to so regulate the admission of air to the fire that the exact quantity of oxygen required may be brought into contact with the fuel. All these drawbacks operate simultaneously, and their combined effect is very serious. In fact, in the case of steam boilers, it is only in rare instances, when very great care has been exercised, that coal which, from its chemical constitution, might be valued at about 13,000 units per pound, has performed an actual duty of about 9,000 units per pound, being a leakage of nearly 31 per cent, and the general waste amounts, in most cases, to about 55 per cent., or even more.

The following table, which is taken from Box's "Treatise," exhibits the average proportionate distribution of the heat in one pound of coal, in the case of an ordinary internally fired Cornish boiler:

	Units.
In ashes, unburnt, 5 per cent. on 13,000..... =	650
Lost by air in chimney, 20 per cent. on 13,000..... =	2,600
Radiation, etc., 12 per cent. on 13,000..... =	1,560
Utilized in production of steam, 65 per cent. on 13,000..... =	8,190
Total.....	13,000

These results may be considered to hold good for any kind of solid fuel, due allowance being made for its special value; the loss by escape of heated air in the chimney being chiefly due to the form of the fuel, which demands a certain amount of draught to draw air through the interstices of the material, in order to ensure perfect combustion. If too little air is admitted, the carbon of the fuel is only burnt to carbonic oxide, instead of to carbonic acid, producing but 4,400 instead of 14,500 units per pound; while the sharp draught essential to obviate this difficulty causes trouble of a different kind, by drawing in a large volume of inert nitrogen with the superfluous oxygen, particularly through a thin fire, and the energy expended in the furnace is so much withdrawn from its proper object, and, therefore, thrown away. —*Journal of Gas Lighting.*

[To be concluded.]

The Lynn Gas Light Company has voted to abolish the office of superintendent, and thus do away with the services of E. Evans, who has been superintendent for the past six years. Mr. George B. Neal, of Boston, is elected vice-president and managing director, and he will institute reform in the Company's affairs.—*Boston Advertiser, April* 23.

[We are informed that Mr. Eugene York, of the Calais (Me.) Gas Company, will assist Mr. Neal in conducting the business of the Company.—Ed.]

Electric Light on the Holborn Viaduct.

The following report on the "experiment of lighting the Holborn Viaduct by means of electricity," from their engineer, Lt.-Col. Wm. Haywood, was presented to the Commissioners of Sewers of the City of London at their meeting on Tuesday, the 4th of March, when it was resolved that the experiment be not continued beyond the three months for which arrangements have been made, expiring on the 9th of March, and that the reference to the Street Committee of the 14th of January last on the subject of photometrical experiments to determine the relative value of the light from gas and electricity, be discharged.

ENGINEER AND SURVEYOR'S DEPARTMENT,
SEWERS OFFICE, GUILDHALL, Feb. 28, 1879.

To the Streets Committee of the Honorable the Commissioners of Sewers of the City of London:—

Gentlemen—In pursuance of your directions to report fully as to the facts relating to this experiment, including the relative cost of lighting the Viaduct by electricity, as compared with gas, I beg to lay before you the following information:

The arrangements were made with the Société Générale d'Electricité for lighting the Viaduct on the "Jablochkoff" system for three months. The works were commenced on the 14th of November, and the lamps first lighted on Saturday, the 4th of December last. They are still lighted nightly.

There are 16 electric lamps in all. Fifteen are placed at intervals alternately on each side of the street, and one in the centre of the carriage-way at the western end of Newgate street.

The existing lamp-columns have been utilized, the gas lanterns and fittings have been removed, and replaced by the globes and apparatus containing the "Jablochkoff candles."

The average distance apart of the electric lamps, measured diagonally, is about 110 feet. Each lamp lights an area of about 888 yards superficial of public way.

The electric lamps are lighted from sunset until midnight. The number of public gas lamps not lighted when the electric lamps are burning is 86. At midnight 61 gas lamps are lighted, 25 lamps remaining unlighted, owing to the electrical apparatus preventing this being done.

The electric current is obtained from two Gramme machines, driven by a Robey steam engine of 20-horse power (nominal), and the entire machinery is contained in a temporary shed erected on vacant land on the western side of Farrington street, not far from the Viaduct.

Each conductor consists of seven insulated copper wires. They are arranged in four separate circuits of four lamps each, so placed that the four lamps on each circuit can be lighted or extinguished independently of the other groups.

The conductors are laid in earthenware tubes beneath the public ways; in the subways they are supported on narrow boards spiked to the walls; they are carried up inside the lamp columns to the globes.

In the bases of the columns are placed the "commutators," for changing the current from one candle to another. Access is given to these by doors in the bases of the columns.

A commutator, for controlling each of the four circuits, is also provided in the engine shed.

Cost.

To attempt to make an exact comparison of the cost of lighting the Viaduct by gas and by electricity for a period of time, including all seasons, would involve much investigation, as well as assumptions, some of which might be liable to be disputed. I therefore lay before you the costs you have actually incurred in electric lighting up to the 18th of February, and what would have been the cost of lighting the Viaduct during that time in the usual way by gas. From these facts, I think, the committee will be enabled to arrive at some practical conclusions as to the relative values of electric and gas lighting.

The company agreed to provide, fix, and to fit up the engine, machinery, conductors, and lamps for £236 8s. 4d. The commission agreed to provide the foundations for the engine and machinery, the shed and its enclosure, and to do all the work beneath the public ways, the cost of which I estimated at £267.

The gas company, on being applied to, at once agreed to deduct the value of the gas not consumed whilst the experiment was being made. This deduction amounted to £50 10s. 10d., up to Feb. 18, and represents the value of the gas that would have been consumed in 61 lamps from sunset to midnight, and 25 lamps from sunset to sunrise.

Considering the responsibility of the commission in case of accident from want of light, and the possibility of the electric light failing, I arranged that a lamplighter of the gas company should be at hand from sunset until midnight, when the gas lamps were lighted. His services were needed on four occasions—viz., on December 19th last, January 10th and 17th, and February 9th of the present year. His wages up to Feb. 18th amount to £18 6s. 3d.

The costs incurred are as follows:

To the Société Générale d'Electricité, for providing the apparatus				£236	8	4
Works executed by the commission, estimated at				276	0	0
Cost of works				£503	8	4
Lighting from Dec. 16, 1878, to Feb. 18, 1879, 64 nights, at £5 per nt.	£320	0	0			
Lamplighter's wages	18	6	3			
	£338	6	3			
Deduct saving in gas (£50 10s. 10d.) and proportion of cleaning, lighting, repairs, etc., on 25 lamps, always out (£5 17s. 4d.)	56	8	2			
Cost of lighting for 64 nights				281	18	1
Total cost up to Feb. 18				£785	6	5

The 16 electric lamps are to be lighted from sunset to midnight, at a charge of £5 per night. The average time they have been alight during the experiment is about 7 hours nightly.

At £5 per night for the 16 lamps, the cost per lamp per hour is 10.7d. Assuming them to have been lighted for the remainder of the night at the same rate of charge, the cost for the whole would be £10 per night.

A gas lamp on the Viaduct, including lighting, extinguishing, and cleaning, costs £4 17s. 6d. per annum. It is alight 4,300 hours annually, and the cost of each lamp per hour is 0.27d., or but little more than ¼d.

The cost, therefore, of lighting the Viaduct during these winter months by electricity would be 14s. 3½d per hour, and by gas, 1s. 11½d. per hour; or per night of 14 hours duration, £10 by electricity, and £1 7s. 1½d. by gas

Applying these rate to a whole year, electric lighting would cost about £3072, and gas lighting £419. Electric lighting, at present charges, is therefore about 7½ times as dear as gas lighting. It is of course probable that, as a permanent arrangement, electricity would cost less than this, while there is reason to believe that no material reduction would be made in the cost of lighting by gas.

If interest be taken on the capital expended in the plant and machinery for the electric light, the cost will be slightly increased.

Illuminating Power.

I have not yet seen an account of the relative illuminating power of the electric light and gas light, which is admitted on all hands to be correct, although it is possible such information may exist. In relation to street lighting, there are other considerations affecting the question besides that of the intensity of light at given points. I can therefore only lay before you some very general statements on the subject, and such assumptions, based thereon, as appear to me to be reasonable, and the results given must be taken as approximate only.

Each electric lamp is said by the Société to be equal to 100 gas burners, such as are used in the streets of Paris. Those burners, I have reason to think, consume about the same quantity of gas per hour as those in the streets of the city of London. The illuminating power of the London gas is equal to 16 candles (London standard), whilst Paris gas, by the same standard, has a power of 12 candles, or 25 per cent. lower than that of London. If these assumptions be correct, 16 electric lamps should give light equal to that of 1,200 of the city gas lamps; and as there are 86 gas lamps on the Viaduct, there should be, with uncovered lights, about 14 times more light given by electricity than gas.

The opalescent globes, which enclose the electric candles, are said to obstruct about 60 per cent. of the the light. In my previous report I took 50 per cent. as the reduction, and I had better adhere to that figure here. On this assumption, the 16 electric lights give about 7 times more light than the 86 gas burners.

It must, however, be held in mind that the electric light is given off with great intensity from 16 points only, whilst the gas is given off at 86 points. Thus the feebler light is more uniformly diffused than the stronger. For street purposes, the indivisibility of the electric light, and the diffusibility or quality of the light, are points to be thought of when comparing the value of these two modes of street illumination.

The broad results of the experiment appear, therefore, to be that the electric light on the Viaduct is about 7½ times the cost of gas, and that, subject to conditions under which it is given off, the illuminating power of the electric light is about 7 times that of gas.

(Signed) WM. HAYWOOD,
Eng. and Surveyor.

Bye-Products.

CARBOLIC ACID.

This substance is one of the alcohols, as its chemical formula will show, C_6H_5Ho, and is known as phenyl alcohol. It also goes under the name of phenol and phenic acid. Of late years it has come into extensive use as a disinfectant, and was largely used by Prof. Lister in the Edinburgh Medical School in his antiseptic treatment. As regards its disinfecting properties, I will speak more of presently. We will now confine our attention to its technical uses and manufacture.

It is prepared direct from coal tar. You will remember that after the anthracene distillate was collected, it was re-distilled. The carbolic acid is one of the products of the distillation. The runnings between 150° and 200° are collected separately, and run into a special receiver. Solution of potash is run in, and well mixed with the liquid, and afterwards solid hydrate. After agitation, the whole is allowed to settle, when the phenol is precipitated as a crystalline powder. This is collected and dissolved in hot water which separates the oily matters. These are removed, and the remaining liquid treated with hydrochloric acid to neutralization, when the impure carbolic acid rises to the surface.

This is washed, and afterwards treated with fused chloride of calcium to remove the water and the mixture distilled. The runnings between 186° and 188° are collected separately, and repeatedly purified by distillation, the resultant being almost pure carbolic acid. The addition of a crystal of solid acid dropped into the liquid will at once cause it to crystallize throughout the mass. Many of the commercial samples

are usually sold in the liquid state, but these are always more or less impure, tar oils of varying densities being the usual adulterants. Their presence is easily tested, for pure carbolic acid is completely soluble in a solution of caustic soda. If on treating a sample with such alkali the liquid is cloudy it should be allowed to stand and settle, and the adulterants will separate from the remainder of the fluid, either rising to the surface or sinking to the bottom of the liquid according as they are light or heavy oils. Carbolic acid is soluble in water to the extent of one part in 33, and when pure should be solid below 41°C. Calvert's acid, which is one of the purest brands in the market, is prepared by cooling a solution of the ordinary acid, and at about 4°C a solid hydrate separates out, which is removed out from the mother liquor.

A large quantity of this preparation is used for medicinal purposes, but by far the larger proportion is worked up by pigment makers for the manufacture of picric acid, ceralline, azuline, grenat brown, and salicilyic acid and its salts, the latter playing an important part in modern medicine.

As regards the disinfecting qualities of this substance, it may not be out of place here to say a few words. There is very little doubt that carbolic acid is a powerful antiseptic, but as a general disinfectant it has many disadvantages. It is a difficult matter to pick out any single substance and class it as a general disinfectant; what will do in one class fails in another. Special circumstances demand special treatments. For household purposes I am more in favor of Condy's fluid than carbolic acid. The smell of the latter is objected to by most people, especially when in delicate health. Again, it is a most powerful poison, and several disasters have occurred through the accidental swallowing of the substance which was being used as a disinfectant. Condy's fluid is free from both these objections, and is, I believe, equally efficacious for domestic requirements as carbolic acid. The non-chemical world cannot clearly understand the *modus operandi* of such substances, and they at once come to the conclusion that because certain substance acts as a disinfectant when concentrated that it will naturally do so in a weakened state. As chemists, we know this to be a fallacy. We know that chemical action is totally different when the combination takes place between strong solution and when the same is diluted.

Take, for example, the action of concentrated and dilute sulphuric acid in ferrocyanide of potassium. In the one case we have carbonic oxide gas produced, in the other prussic acid—two very different substances. Carbolic acid, no doubt, when strong enough, is competent to arrest decomposition; but it cannot, under any circumstances, absorb the products of decomposition. Condy's fluid, on the other hand, completely decomposes the products of decomposition by oxidising them to harmless compounds. For a household disinfectant I think we should choose one that is not poisonous, and which gives off little or no offensive odor of itself. If these points were taken more notice of by medical men and others, we should not have the disinclination to use these substances which at present is most marked amongst all classes. For the purification of a room the best thing is fresh air. The air of a sick apartment is usually polluted enough without making it worse with the vapor of chemicals. Good ventilation is far better than disinfectants, and ten times more gratifying and beneficial to a sick person. I have perhaps gone a little out of my way in speaking of the subject in a class of technology, but I could not resist this opportunity, gentlemen, of saying a few words on a subject which is perhaps the least understood of any by the general public.

Before passing on to the manufacture of picric or carbolic acid, let me allude to another form of carbolic acid used for disinfecting purposes—I allude to the so-called carbolic acid powders, which have not been unfrequently called carbolate-of-lime—a misnomer, as the base and acid are not chemically combined but only a mechanical admixture. They are made by causing the lime to take up a quantity of the carbolic acid, and usually smell strongly of that substance. The quantity varies, but can be readily determined by distilling and collecting the distillate and testing it for carbolic acid by a solution of caustic soda, which will at once show whether pure or commercial acid was used in their manufacture.—*Journal of Artificial Light and Sanitary Gazette.*

Report of the Directors and Accounts of the Chartered Company.

We have received the report of the Directors and the accounts of the Chartered Company, to be presented to the proprietors at the half-yearly meeting on Friday next. Nothing can be more satisfactory than these documents. Notwithstanding the almost unprecedented depression in trade, the business of the Company continues to increase; but, unfortunately, on account of the bad sale of coke, and the falling off in the price of tar, the profits are not so large as they might have been.

The sale of common and cannel gas brought £912,851. The sale of coke produced £134,032; tar fetched £36,571; and ammoniacal liquor brought £56,385. These, with other items which need not now be mentioned, make the gross revenue $1,228,-891. Against this must be placed the expenditure, amounting to £857,970, which shows a profit of $370,921.

According to the net revenue account, the balance applicable for dividend on ordinary stock is £336,885, and as the money required for the half year's dividend will be about £204,815, there remains a balance to be appropriated of £132,070. Since the sliding scale came into operation, the excess of profits has until now been wisely devoted to increasing the reserve fund, but as this fund has reached the sum of £137,788, the directors consider they are in a position to give the shareholders an addition to the dividend, which the sliding scale justifies. Hence they propose for the past half year to divide 5½ per cent. The initial price for common gas, it must be remembered, is 3s. 9d. per thousand, and the company now sell for 3s. 6d. As regards the manufacturing department, the accounts show that excellent management is exhibited. The yield of gas per ton of common coal was 10,519 feet. This, it must be remembered, is the average result obtained at all the stations of the company; but we doubt whether if we had details from each manufacturing establishment, we should find much difference.

Steel for the Brooklyn Bridge.

Engineer W. H. Paine, in charge of the Brooklyn bridge superstructure, remarked recently to a reporter for the *Iron Age* that the action taken by the trustees, at the recent meeting of the Bridge Company was probably decisive as determining the future character of the bridge. They resolved to advertise for bids for steel in lieu of iron, as at first proposed, and in the opinion of the engineers steel will probably be adopted. The cost of the material in either case would be about the same, as the reduction in weight would be an offset to the increased cost per pound.

Work has not yet been resumed, though the intention is to proceed immediately to complete the stone towers and anchorages, and to receive bids for the superstructure without further delay. The $1,000,-000 coming from New York will be paid in monthly instalments.

Mr. Paine is quite enthusiastic in speaking of rope traction as a substitute for the locomotive on the bridge. He has made a model illustrating the effects of a change of grade upon the movement of trains. He shows that to travel where the grade is 3 feet in 100 would require a motive power equal to 65 pounds per ton, and an additional power of 8 pounds to overcome friction on any level, equal in all to 73 pounds per ton; and, including the locomotive itself this would be increased to 109 pounds per ton.

"Now," said he, "with a bridge which is highest in the centre, the cars being connected by one endless wire cable, would nearly balance." This he illustrated by raising the grade of the miniature track to correspond with the intended grade of the bridge, the power required being the same as when cars are run on a level. The economic advantage of rope traction, in the saving of fuel, strain on the bridge, and in appliances of various sorts, is spoken of by Col. Paine as out of all comparison.

The Ohio River Coal Barge System.

One of the leading features of the Ohio Valley which most favorably recommends it to manufacturers and others, is the uniformly low rates for good coal from Pittsburgh and other points, and for the information of those interested we have been at pains to collect from the proper sources the following facts regarding the extent and character of the Pittsburgh coal trade:

In Pittsburgh an vicinity there are 50 "operators" or firms engaged in the coal business, about one-half of whom sell at the mines, the other half are "shippers" engaged in running coal to Southern ports. The shipments for Southern consumption from Pittsburgh amount annually, on an average, to 80,000,000 bushels of coal and 20,000,000 of coke, which is sent South by the shippers on the tides as they occur. For this purpose they employ 96 tugs or towboats and about 1500 barges and "shells," in which the coal is transported. Each barge costs about $1000 and carries from 12,000 to 13,000 bushels. The shells cost about $500, and they carry about 24,000 bushels. The barges, when unloaded at their destination, are returned to the mines; the shells are generally sold in the South, and broken up for other uses by the purchasers.

On an average there are 10 coal tides or "rises" at Pittsburgh during the year, which occur suddenly, and frequently last only from 24 to 36 hours. The barges and shells must, therefore, be kept loaded and ready for departure at an hour's notice. When the opportunity arrives the tows are lashed to the tugs, each taking about ten barges, containing, say, 150,-000 bushels of coal, the great length of the tows, and the short time allowed by the rapidly falling river, requiring the most expeditious movements.

By this admirable barge system, coal is kept at a price but little above that of Pittsburgh to the cities above the falls of the Ohio, the expenses of running the coal to Louisville, including the cost of returning the barges to the mines, being only about one and a-half cents per bushel.

Thus is accounted-for the usual low price of Pittsburgh coal at Louisville, the average for the past five years being only 6½ cents per bushel. It is true that the development of the Kentucky coal mines and their large and increasing production check speculative prices and coal famines, but the barge system enables us to procure Pittsburgh coal at low rates, and, on the other hand, this supply keeps the Kentucky coal men in check, as is shown by the following statement: Since the 1st of December last—three months—the receipts from Pittsburgh at Louisville have been only 30 barges, and the price to-day is but seven cents per bushel.—*Louisville Manufacturer.*

Dry Coating for Basement Walls.—Take fifty pounds pitch, thirty pounds resin, six pounds English red, and twelve pounds brick dust. Boil these ingredients and mix them thoroughly; then add about one-fourth the volume of oil of turpentine, or enough to flow easily, so that a thin coating may be laid on with a whitewash or a paint brush. Walls thus coated are proof against dampness.—*Der Techniker.*

THE AMERICAN GAS-LIGHT JOURNAL AND CHEMICAL REPERTORY

A. M. CALLENDER & CO.,
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FRIDAY, MAY 2, 1879.

Official Report of Examinations of Gas for two Weeks ending April 26, 1879, made at the Photometrical Room of the Department of Public Works.

Corrected Illuminating Power.

Apl. 1879.	Time of Day at which Test were made.	New York Gas-Light Co.	Manhattan Gas-Light Co.	Mutual Gas-Light Co.	Metropolitan Gas-Light Co.	Harlem Gas-Light Co.	Municipal Gas-Light Co.
14	Between 9.30 A.M. and 1 P.M.	17.15	17.19	19.02	16.05	16.03	
15		16.76	16.74	18.53	16.34	16.32	
16		16.93	17.07	18.71	16.30	16.41	
17		17.24	17.35	18.52	16.39	16.30	
18		16.92	16.95	18.48	16.28	16.07	
19		16.81	16.90	18.63	16.57	16.77	
	Average	16.97	17.03	18.65	16.32	16.31	
21		17.09	17.29	18.59	16.91	16.88	
22		16.90	17.10	18.71	17.01	16.96	
23		16.72	17.00	18.59	16.91	16.72	
24		16.74	17.13	18.68	16.76	16.58	
25		16.85	17.13	18.92	16.86	16.89	
26		16.95	17.22	18.73	16.96	16.75	
	Average	16.87	17.14	18.70	16.90	16.79	

Sugg-Letheby burner.

E. G. LOVE, Gas Examiner.

Reduction in Price of Gas at Waltham, Mass.—After the 1st of April the price of gas will be reduced to $3.50 per 1,000 cubic feet, and all bills paid at the office on or before the 15th of the month will be allowed a discount of 50 cents per 1,000—net price $3

Notes on Sulphate of Ammonia.

TRANSLATED FROM "LE GAZ" FOR AMERICAN GAS LIGHT JOURNAL BY A. P. TRAUTWEIN.

In connection with the Paris Exposition the "*Compagnie Parisienne d'Eclairage et de Chauffage par le Gaz*" published a series of notes on the several products and apparatus exhibited by it; these notes, taken as a whole, constitute a very interesting collection in more than one point of view. We propose to publish from them those parts which are more particularly interesting to our industry, and we begin to day with notes on the subject of sulphate of ammonia.

The ammoniacal livuor which collects in the hohdensers and other apparatus employed in the manufacture of illuminating gas were formerly allowed to waste in the rivers, to the great annoyance of the inhabitants, and were lost for agricultural and industrial purposes. In 1856, at the time of the amalgamation of the companies who lighted the city of Paris, several works had already commenced to utilize this bye-product of the distillation of coal; but it may be stated that only since that period has the treatment of the ammoniacal liquor become an object of systematic manufacture and an accessory to the gas industry.

The Paris Gas Company possesses three chemical works, in which it treats the entire ammoniacal liquor derived from its gas works. These works are situated at its most important stations: at La Villette, at Vangirard, and at St. Mandé. They are in communication with the gas works in these localities by means of underground pipes, which serve to convey the liquor to be treated. The gas works at Ivry, Belleville, Fernes, Passy, Boulogne, Maisons-Alfort, and St. Denis furnish the raw material by means of portable boiler-iron tanks.

The ammonia works possess the requisite plant—like reservoirs, pumps, motors, and a proper and complete stock of tools. Their manufacturing plant includes 38 apparatus on Mallet's system, as originally installed, two on the Solvay system, and two vertical stills on Marguerittе's system, constructed during the past few years.

These successive improvements in the processes of manufacture were made especially for the following objects:

1st. To obtain products of a superior and perfectly uniform quality.

2d. To provide perfect safety for the men; and

3d. To suppress all dangerous emanations, and to prevent all sources of loss.

The greater portion of the products manufactured by the company is consumed in France. The quantity of sulphate of ammonia sold annually for home consumption amounts to about 8,800,000 pounds.

But a very few years ago sulphate of ammonia was employed only in the manufacture of alum, and in making up certain compound fertilizers. Thanks to the efforts of, and the steps taken by, the Paris Gas Company, thanks to the experiments which it has encouraged, and to a more general diffusion of agricultural science, it has now found, as it were, an almost unlimited market.

Farmers, instead of relying as heretofore upon the dealers in fertilizers, now make up their mixtures themselves for any given produce—sulphate of ammonia, phosphate of lime, salts of potash in certain cases, etc., and thus obtain a fertilizer whose composition is exactly known, giving results which are always the same, and which are capable of comparison with, and are often superior to, those obtained by the use of guano itself.

Use of Sulphate of Ammonia in Agriculture: its Composition.—Sulphate of ammonia contains 20 to 21 per cent. of nitrogen; it is a grayish-white hygroscopic salt which, in order to preserve it in good condition, should be kept in a dry, closed place.

It would be a difficult matter to adulterate sulphate of ammonia. In order to determine its purity, it is simply necessary to throw a small quantity into a glass of water. If pure, the salt should dissolve immediately, and leave no deposit of any kind in the bottom of the glass. In subjecting the salt to a high temperature, it completely evaporates. The experiment can be made in an iron spoon; if, with a fraudulent intention, soluble mineral salts have been mixed, these foreign substances would leave a solid residue,

Fixed State of its Nitrogen.—Of all known substances, this is the richest in nitrogen assimilable by the plants. This element exists in a fixed condition, and consequently is not subject to loss by volatilization like the nitrogen in the guano from Peru, and, indeed, in all fermentable matter. Its effects are less rapid than those of the Peruvian guano, but they are more lasting.

Sulphate of ammonia acts upon the soil both by aid of its nitrogen and its sulphuric acid, which supplies the plants with the requisite amount of sulphur, and which is also active in aiding the assimilation of the potash contained in the soil.

Its Action and its Effects.—Supplying, as it does, the soil with nitrogen and sulphuric acid only, sulphate of ammonia must not be regarded as a complete fertilizer, no more than either nitrate of potash, nitrate of soda, the sulphates of potash and of magnesia, or the natural phosphates lime, etc., when employed alone; the addition of some kind of dressing is what insures and accelerates the growth of vegitation and endows the plants with great vigor. It is necessary, then, to employ it in moderate quantities in the case of cereals, if it be desired to prevent loss of seed, and, in the case of potatoes and beets, too great a growth of leaves, to the detriment of the root and tuber. It can be used in large quantities in those soils only which are abundaetly provided with a dressing composed of other substances beneficial to plants.

Plants Benefited by it.—Sulphate of ammonia, like every nitrogenous substance, is beneficial to all plants. It is particularly so in the case of cereals, ordinary meadows, flax, hemp, the colza, and all other oleaginous plants, and to trees and potatoes. In the case of vegetables, clover, lucern, grass, and other fodder, deriving the greater part of their nitrogen from the atmosphere, sulphate of ammonia can only be applied in small quantities, and with a view to insure the raising of seed.

Quantities per Acre.—For cereals, whether used alone or with the addition of a mineral fertilizer or dung, sulphate of ammonia can be applied in a dose varying from 133 to 266 pounds as a maximum, according to the nature of the soil. When the soil is well dunged, the maximum dose will not be injurious and bring about a dropping of the seed. An excess in a poor soil, on the other hand, will develop beyond measure an herbaceous vegitation, and would produce more chaff than grain.

In the case of beets and potatoes, 133 to 178 ponnds per acre is sufficient; if used in a larger dose the beet would become watery and poorer in saccharine matter, and the potato would yield a more vigorous foliage at the expense of the tuber. The result of comparative experiments made in 1868 by the Société d'Agriculture de Seine-et-Marne (Proceedings of the Society for Feb. 11, 1879), on the use of dung and the most important chemical and commercial fertilizers for beets, have placed the sulphate of ammonia of the Paris Gas Co. at the head of them all.

For hemp, the colza, and other oleaginous plants, the dose may vary from 178 to 267 pounds, according to the character of the soil. For meadow land, 90 to

180 pounds is used; a greater dose would injure the second crop.

Times and Modes of Application.—Sulphate of ammonia is applied as follows: in the autumn, for cereals and other plants; in the early part of spring, on meadow land, for March wheat, oats, and other spring fodder; and during April and until the end of May, for beets and potatoes,

In the case of wheat, many farmers use one-half of the dose in autumn with the dressing, and the other half in spring with the covering.

Sulphate of ammonia is readily spread from the hand, either alone or mixed, preferably, with half its weight of fine earth, ashes, or plaster. It can also be distributed by means of a seed drill. It should never be mixed with lime, nor should it be spread on soil that has recently been limed, since the lime would liberate its nitrogen, to the detriment of the plant.

London Gas Light and Coke Company.

At the half-yearly meeting of the London Gas Light and Coke Company, the Chairman (the Hon. R. H. Browne), in moving the adoption of the report, said the manufacture of gas during the past year had increased by 9·78 per cent., which was the largest increase that had ever taken place in the company since he had belonged to it. That was very satisfactory, and the increase was at the present moment progressing. No doubt the meeting would expect a few words from him on that all absorbing topic the electric light. The experiment in Paris showed that the cost of lighting by electricity was four times that of lighting by gas, and the extinction of the lights had risen from 1 to 20 per cent. there. The light had been tried on the Holborn Viaduct the Thames Embankment, and in Billingsgate Market. He had received a return from the chief inspector of the company that the lights were not free from extinction and that occasionally the engines broke down. The lights on the Embankment had been unequal and flickering. In Billingsgate the men complained of the want of warmth from the gas and asserted that the light had the extraordinary effect of changing mackerel into whiting. On the 30th ult. the lighting of Billingsgate by electricity ceased. The same argument might be adduced against its applicability for domestic purposes. It was the intention of the Board to apply to Parliament for various powers for the purchase or hiring of stoves and other appliances, the object being to encourage and even force the extended use of gas as a warming agent, and as an agent for domestic purposes —*Iron*, London.

Imitation Ebony.—Oak may be dyed so as to resemble ebony by soaking it for forty-eight hours in a hot saturated solution of alum and then painting it with a decoction of one part Campeachy wood in eleven parts water. This decoction should be first filtered and slowly boiled down to one-half its volume, when ten to fifteen drops of neutral indigo tincture should be added to every quart. After the application of this solution the wood should be rubbed with a saturated solution of verdigris in acetic acid. The operation is to be repeated till the desired tint is obtained.—*Der Techniker.*

A Real Telegraph.—A new invention, of a really practical character, not a mere "paulo post futurum" invention like many we have heard of lately, has just been made by Mr. E. A Cowper, the well-known mechanical engineer. It is a real telegraphic writing machine. The writer in London moves his pen, and simultaneously at Brighton another pen is moved, as though by a phantom hand, in precisely similar curves and motions. The writer writes in London, the ink marks in Brighton. We have seen this instrument at work, and its marvels are quite as startling as those of the telephone. The pen at the receiving end has all the appearance of being guided by a spirit hand. The apparatus is shortly to be made public before the Society of Telegraph Engineers.—*Nature,*

OUR EXCHANGES.

United States.

[*Engineering News.*]

The Columbus (Ohio) Gas Company has made a proposition to furnish gas for the State House during the present session of the Legislatuse at $1.50 per 1,000 feet.

Did you ever know a gas company willing to reduce its rates, even though everything else had declined 40 or 50 per cent., or a gas company's director who refused free gas or fat dividends? Never. What! Never? Well, hardly ever.—*Syracuse Jour.*

An exchange remarks: "We must give it up. Two courts, we are told, have decided that the gas company of St. Louis is dead, yet the company persists in asserting vitality, which the *Post* of that city considers absurd, after the courts declared the company a corpse."

The New Orleans *Democrat* states that the City Council have agreed that "should the backwardness of taxpayers continue to manifest itself as it has since the beginning of the year, the city will, on the first of next month, find itself compelled to break its contract with the New Orleans Gas Light Company to light its streets."

A bill has passed the Ohio General Assembly, authorizing the Council of the village of Middletown, Butler County, to make a contract with the Middletown Gas Company for lighting streets, alleys, and public buildings, for a period not to exceed ten years, and to levy taxes to pay the cost as it becomes due, by the terms of said contract.

John Maxwell and Andrew King, secretary and assistant secretary of the Wheeling (W. Va.) Gas Company, a city institution, were arrested April 9th, charged with embezzlement and attempting to burn the books of the company two weeks previously. The affairs of the company are being investigated by a committee of the city Council. The accused gave bonds in the sum of $8,000 to answer on the 19th of April.

A special committee of the City Council, Cleveland, Ohio, is considering the question of lighting Monumental Park in that city with the electric light. The present cost of lighting 105 gas lamps is $2,052.75 per year, and the lowest proposition that can be obtained for the electric light is $1,978·50, or a saving of $74.25, the proprietors of the electric system agreeing to give double the amount of light, according to the present time-table.

[*Coal Trade Journal.*]

The Gas Light Co. at Halifax, N. S., has reduced the price of gas to $2.50 per thousand, and date back to February 1st.

The prices made this year for the gas coals is lower by $1 a ton than it has ever been. The Penn and Westmoreland Coal Companies appear to be determined to keep the trade that they have worked up for their coal. The Gas Light companies now being supplied at this low rate will be in a position to make such rates for their commodity that the consumption will be largely increased. When this is done, where will be the necessity or opportunity for the electric light?

One of the surest signs of the steady advance of business prosperity is to be found in the improvement of the iron trade. In looking back over the last quarter of a century, an impartial observer can not fail to see that with the progress of our iron trade other interests of our commercial world are largely interwoven. The vast improvements that have been made in the substitution of steel rails, where iron was formerly used, necessitated, at the beginning, a loss; but with the tide once fairly turned, the advance in the future is sure to be steady.

Prices of Gas Coal.

Penn and Westmoreland	$4.50 at New York.
" "	3.50 at Baltimore.
" "	3.75 at Philadelphia.
Despard, Newburgh Orrel, Murphy Run	4.25 at New York. 3.50 at Baltimore.
Chesapeake & Ohio	4.50 at New York.
" "	
Newcastle	3.25 to 3.50
Provincial	3.50 to 3.75
Cannelton Cannel	8.50 at New York.
Ince Hall	7.25

The above prices are about $1 per ton below those of 1878.

Gas Stocks.

Quotations by G. W. Close Jr., Broker and Dealer in Gas Stocks.
(with W B Scott & Co.,)
24 Pine Street, New York City.
May 2, 1879.

☞ All communciations will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

Gas Co.'s of N. Y. City.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Central	466,000	50	60	75
Harlem	1,800,000	50	40	45
" Bonds	170,000			103
Manhattan	4,000,000	50	175	182
Metropolitan	2,500,000	100	117	122
" Scrip	$1,000,000	...	99	103
Mutual	5,000,000	100	65	70
" Bonds, gold	900,000	1000	98	103
Municipal	1,500,000	100	110	117
" Bonds	750,000		95	100
New York	4,000,000	100	100	103xd
Nothern	270,000	50	—	100
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	140	145
Citizens	1,200,000	20	72	80
" Scrip	320,000	1000	90	95
Peoples	1,000,000	10	20	30
" Bonds	325,000	...	--	95
" Scrip	300,000	...	75	80
Metropolitan	1,000,000	100	60	65
Nassau	1,000,000	25	70	75
" Ctfs.	700,000	1000	90	95
Williamsburgh	1,000,000	50	85	90
" Scrip		...	90	95
Kings Co	200,000	100	—	70
Union Co. E. N. Y.		25	—	50
Richmond Co., S. I.	300,000	...	60	85
Out of Town Gas Companies.				
Bath, Maine	70,000	100		
Buffalo Mutual, N.Y	750,000	100	65	70
" Bonds	200,000	1000	95	100
Baltimore, Md	2,000,000	100	95	98
" Ctfs., gold	1,000,000		95	10
Bayonne, N. J		100		90
Brockport, N. Y	25,000	100	...	80
Citizens, Newark	918,000	50	100	103
" " Bds.	124,000	—	105	10
Chicago Gas Co., Ills			128	130
Cincinnati G. & C. Co.				190
Derby of Conn	160,000	100	60	80
East Boston, Mass		25	114	120
Elizabethtown, N. J.	300,000	20	—	130
Fort Wayne, Ind.		100	...	—
Hannibal, Mo	100,000	100	95	100
Hartford, Conn	700,000	25	120	125
Hempstead, L. I.	25,000	100	...	—
Jersey City	386,000	20	135	145
Jamaica, L. I.	25,000	100	...	—
Jacksonville, Ill	120,000	50	100	...
Lewistown Maine	400,000	100	70	80
Lima, Ohio,	60,000	100	—	...
Bonds	30,000		90	
Laclede St Louis Mo.	1,200,000	100	—	75
Long Branch		20	30	40
New Haven, Conn		25	156	152
Peoples, Jersey City		...	—	80
" " Bds.				95
Peoples of Albany	650,000	100	—	10
" Bonds	350,000	1000	--	--

Peoples of Baltimore		25	44	48
" Bonds....			106	---
Plainfield, N. J.....	80,000	100	—	105
Perth Amboy		25	—	95
Rochester. N. Y.....		100	70	80
" Citizens		100	50	60
Toledo, Ohio..... ..			95	97
Washington, D. C...	1,500,000	20	190	200
" Scrip	500,000	20	100	—
Yonkers.....		50	70	80
Woonsocket, R. I....	150,000	100	80	...
Halifax N. S.....	400,000	40	148	150
Hamilton, Ontario..	150,000	40	117½	
Pittsfield, Mass.....			120	130
Rondout & Kingston			75	80
St. Louis, Missouri..	600,000	50	73	75
Stillwater, Minn.....	50,000	50	—	26
Saugerties, N. Y	15,000	100	95	100
Troy, Citizens..	600,000	100	—	60
San Francisco Gas-Co., S. Fr'isco Cal.			95	95½

The New York Gas-Light Company have declared their semi-annual dividend of four per cent., payable May 1st at their office. 40 shares of Manhattan, sold at auction, at 181; 25 shares of Metropolitan, of New York city, at 120.

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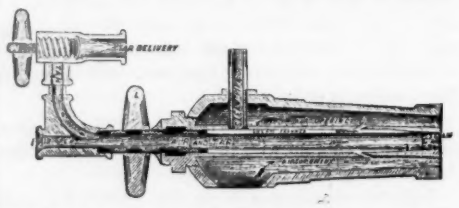

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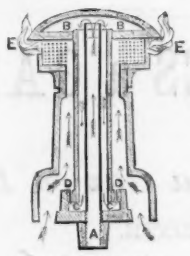
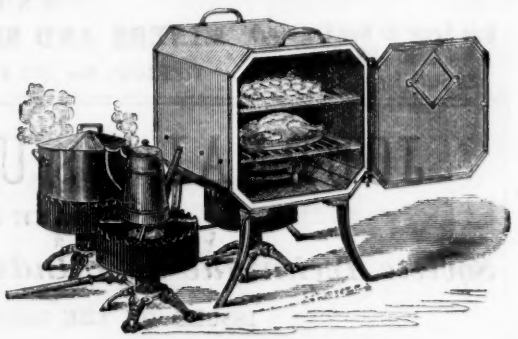


Principle of Burner.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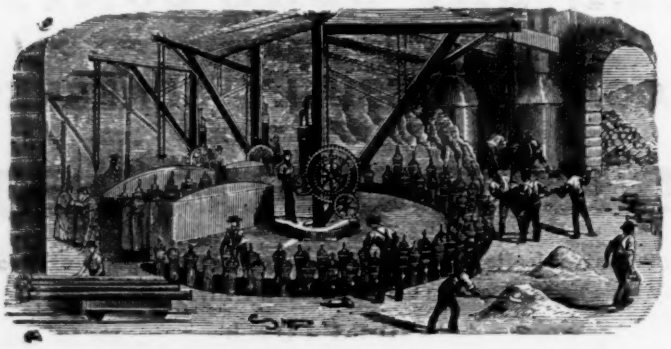

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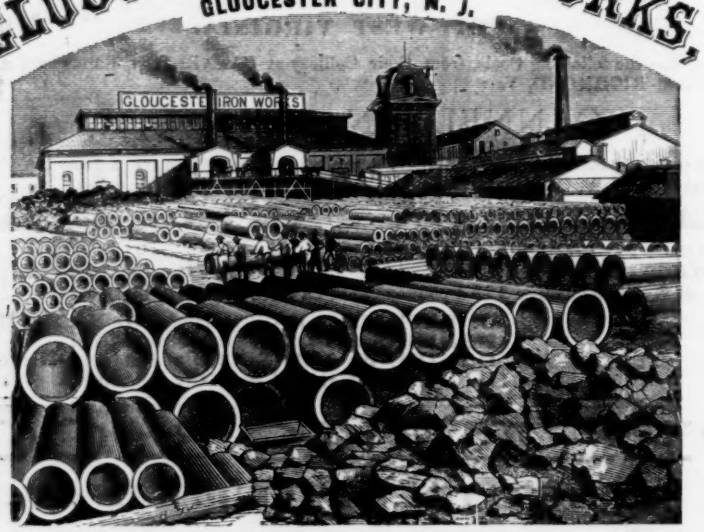

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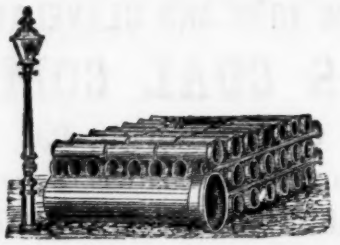

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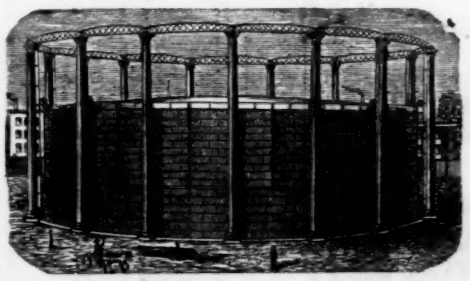

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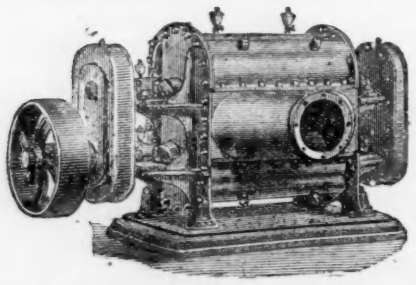

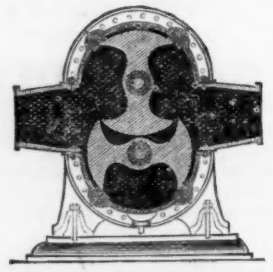

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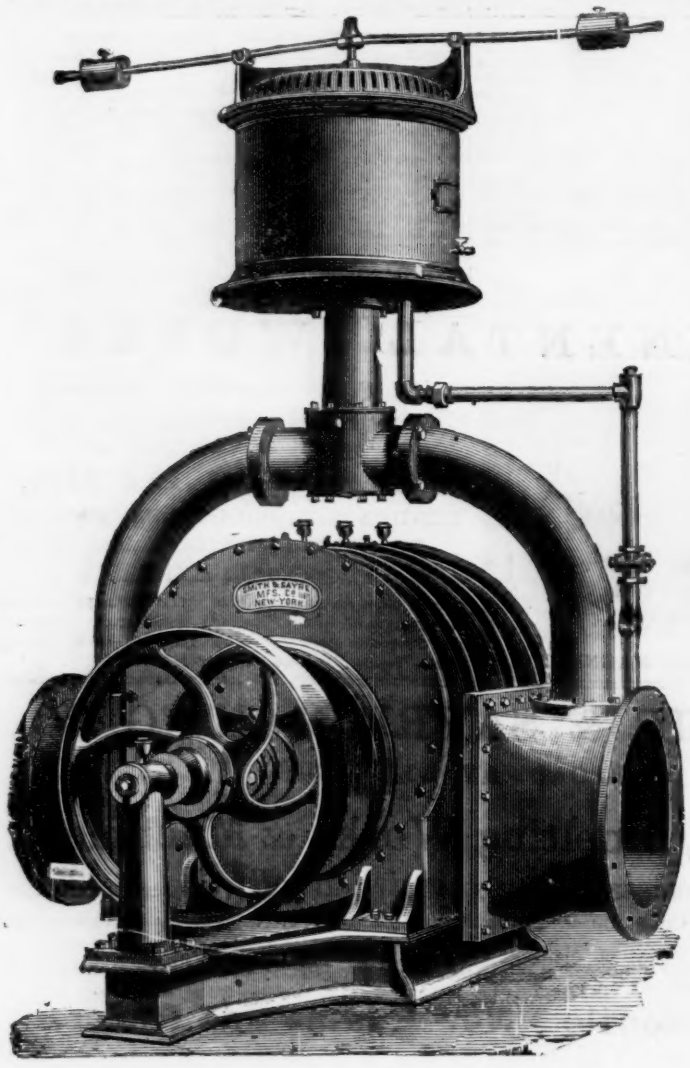

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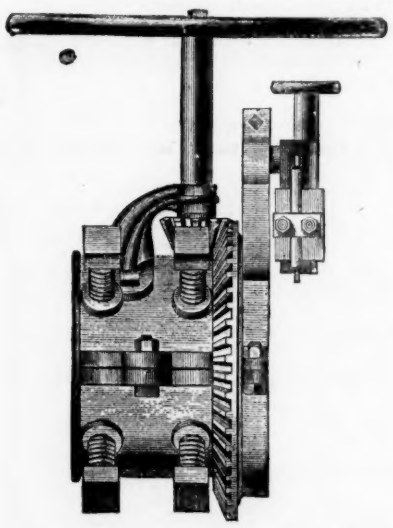

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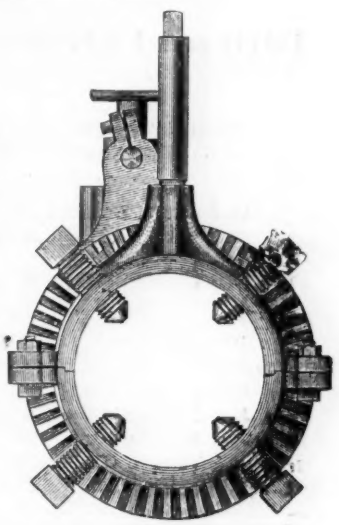

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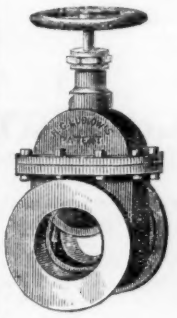

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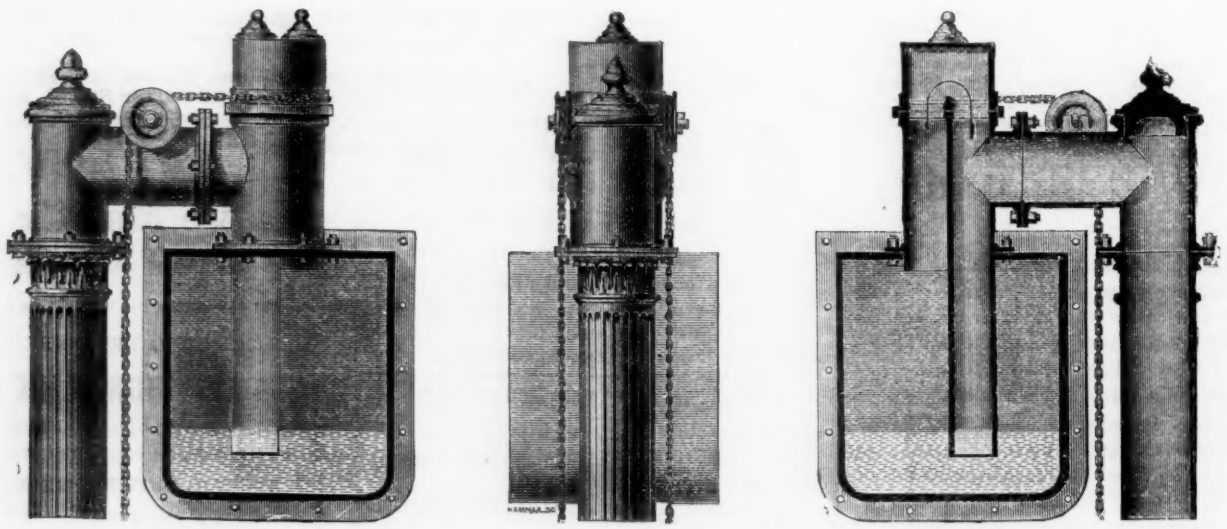

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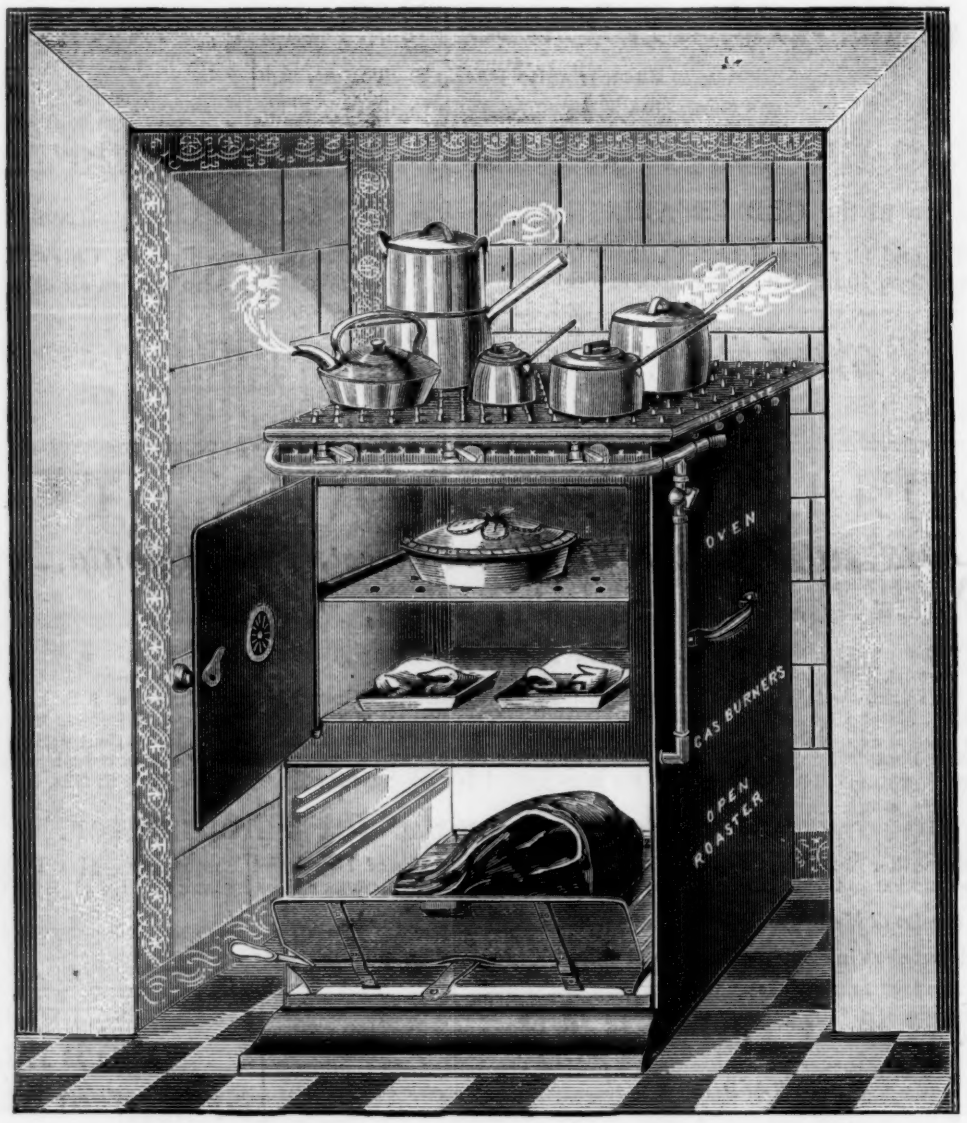

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